RAILROAD GAZETTE

FRIDAY, SEPTEMBER 4, 1903.

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Contributions

The Superintendent as a Judge.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In his contribution of August 7, "W. L. R." says that to the conductor or engineer hauled up for misconduct, the Superintendent has to be counselor, and friend, as well as a just judge. There is room for considerable difference of opinion as to the *just* part of it. A great many "supers" have no sense of justice, their own ideas being paramount, and, as they think, the only correct ideas. When a man in power will let personalities influence him in the performance of his duty as a judge (or disciplinarian if you will), there is need for the training school of superintendents, as outlined by W. L. R. One cannot expect a high standard (I mean a moral as well as a practical standard) among the subordinates, if the recognized head fails to set the standard and maintain it. If he is arrogant, profane, and vulgar, can we expect the rank and file to respect him? They may fear him, and even at times imitate, but there can be no respect. Let me give an incident.

Scene, on the carpet.

I think, Simpkins, I will have to take you off that train. (Simpkins, by the way, was engineer of a local freight.)

Yes; and what is the charge against me?

Oh! Well, you are not making the time; the train is always late. You are out in society too much; and besides, you are too old. (Simpkins is not 50 years old.) You are losing your grip. By the way, Simpkins, you used to run passenger trains, I believe?

I did.

And how is it you are running this local freight?

Well, on the local I can be at home every night, so I asked for it in preference to the passenger run.

Well, er—I'll consider your case. I don't know what I can do for you.

A few days later Simpkins is put on a work train, and Blifkins is put on the local. In a short time the work train is taken off, and Simpkins, the Super. and the Master Mechanic meet at the shops, when Simpkins is given his choice of a job as hostler at two dollars a day, or nothing. All this after devoting the best part of his life to the service of the company, while the Superintendent is an imported man. Now, would it not have been more just, when the question of making time was considered, to call up on the carpet both ends of the train? I know from experience that the engine cannot run both ends, and if time is lost waiting to shuffle waybills, and to talk with agents and operators, the engine can do only so much between stations. The interesting part of this actual case is in the fact that after the change, Blifkins (who is a young man that hasn't lost his grip), fails to get the local in on time once a month, while the personnel of the rear end still remains unchanged. Can we condemn men for joining a union, to protect themselves from such "justice" as this?

In the good old days there were good jobs in the railroad world. Men did not grow old so fast. They did not get so much money perhaps, but neither did they work so hard. Now, there seems to be a race of railroads to see which can make the best time and which can get the largest engine, and haul the largest number of cars in a train. Responsibilities have increased and the work is harder, and more trying. Yet the wages have not increased in proportion; and the end is not yet.

J. V. N. CHENEY.

A New Spelling of the Word Engineer.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There has been of late years a general and sustained discussion in the engineering papers as to the causes why the engineering profession in the United States (and we may add, Canada) does not enjoy the status and distinction it does in Europe. The engineering profession has been the last to enter the lists of the so-called learned professions and has had to contend against the long established prejudices and jealousies of its older brothers; but in Europe the fight has been fought and fairly won, and there is no danger of relapse. In Germany especially did the lawyers resist to the last ditch in attempting to shut the engineers out from the higher administrative offices in the state railroads, but to no avail. It has often been commented on how in England engineers have been honored by titles, monuments, and what is better, emoluments, while in America this is practically unknown. Titles we cannot bestow, but monuments and emoluments we could. A great deal of earnest discussion has been had and many reasons advanced for the cause of the phenomena mentioned. Among these reasons the most potent one is the lack of a distinctive name for the profession of engineering to distinguish it from the trade of engineering. In England nobody speaks of the man behind the throttle as an engineer, but calls him the "driver," no matter how heroically he may have acted in saving the lives of his passengers. The man who pulls the stationary throttle is there an engineman or machinist. It seems strange that in America the fireman has rested content with his humble appellation and has not taken to himself the better sounding "assistant engineer." Why this confusion of terms has sprung up and continued need not be more fully dilated on, as the causes are well known to the student of the history of our social development and have been thoroughly exposed more than once. But the time seems ripe for a change, as we have outgrown our provincialism together with many antiquated notions. It does not need extended argument to show the enormous strides made in the practice and teaching of the engineering profession within the last 20 years, and that in fact as well as in theory we have as fine a body of professional men as any European country. Years ago, any half fledged "native" engineer would have resented it as an insult if it had been intimated that a "Dutchman," no matter how competent, could compare with him in any respect, but those glorious days have passed to return no more.

But how can this differentiation be accomplished without a revolutionary movement comparable to such a one as would follow the introduction of the metric system? Simply by the change of two letters, or rather the transposition of two letters. Alter the spelling of the professional "Engineer" to "Ingeneer" and the trick is done. Let the "engineers" rest content in the possession of the ancient word, which by its derivation from "engine" is really the appropriate term for them. The professional man's term "engineer" is, as a matter of fact, derived from a different root, the same as that of the word "ingenuous" or the French génie. To ask the American public to take up the English practice of speaking of drivers, would seem a hopeless task, compared to which the innovation proposed is child's play. Besides, if the engineers took it into their heads to construe the English mode of speaking of them as an insult, dire consequences might follow. Engineers can and do, but ingeneers will not strike. If the mountain will not come to Mahomet, Mahomet goes to the mountain. The advantages of this change would be very great and far-reaching. By it we should at once acquire a specific name to distinguish the profession from the trade, with the consequent illumination of the public and other professional mind, especially the legal. The importance of the right word for the right thing is so enormous and so well understood, both by the business man and the student of history, that it would be a superfluous task to try to fortify the proposition by examples. Words stand for ideas and the clearer and richer our vocabulary, the clearer are our ideas and conversely. Our language is living and plastic to meet the needs of our active advance in all directions of modern thought, and the change suggested does no violence to either scientific philology or common sense. In a short time the oddity of the new spelling would disappear. Perhaps even a period of cheap ridicule and irrelevant comment might have to be passed through, but would undoubtedly be short lived. Our English cousins may object to the change as being unnecessary under the conditions obtaining in the old country, but we might hope that they could be persuaded to join the movement for the greatest good to the greatest number.

HENRY SZLAPKA, *Consulting Ingeneer.*

Deep Sea Trade in American Ships.

New York, Aug. 20, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

May I ask, is it really "inevitable" "that any kind of legislation to enforce deep sea trade in American bottoms is a species of class legislation, directed either at the ship builder or at the ship owner, but conferring no service on the shipper?"

Of the 40,000,000 to 50,000,000 tons of freight, substantially equal to the aggregate water borne freights of both London and Liverpool, that will be floated past Detroit this season, over 95 per cent. will be in American bottoms. Some 20 years ago Mr. J. Stephens Jeans, as Secretary to the British Iron Trade Association, called attention to the contrast between our over-sea and coasting trades, explaining it by the assertion: "The one is free, the other is protected." Possibly you have some mathematical man in your employ, well versed in the theory of probabilities, who can say what our producers and consumers would pay for lake freights if legislation did not enforce coasting trade in American bottoms and we trusted to our Canadian friends for freight vessels?

Nor can I fully agree with your opinion: "When attempts to re-establish an American deep-sea fleet are viewed from a purely economic standpoint the item of cost of service rendered becomes formidable."

Although the wages paid on American railroads and in American machine shops are probably twice as high as in European countries, they charge from nearly twice to fully three times our freight rates, and in spite of our domestic demand for locomotives we exported over $3,000,000 worth the last fiscal year. There is nothing anomalous in this. As long ago as May 15, 1848, the great economist, David Ricardo, said in the House of Commons: "It was a singular circumstance that although the American vessels were the dearest built and dearest manned ships in the world, they had two-thirds of the whole trade between this country and the United States; while the Russians with the cheapest ships in the world were obliged to give us up the whole trade between their country and ours." This was said when the mutual repeal of the restrictive clauses of the navigation acts of this country and England was under discussion; a time when even ministers and literary persons were proud of our merchant marine.

At that time we did two-thirds of the trade between this country and Great Britain because, as explained by Ricardo, while one American vessel could load in all British ports with any cargo offering, British vessels in all ports were confined to a cargo of British products. No satisfactory estimate can be made of the increased cost of over-sea freights consequent on our withdrawal from active participation in ocean freightage which followed the consummation of that bargain.

During the 30 and odd years I have been reading the *Railroad Gazette* its well-considered articles have invariably been based on thoroughly ascertained facts and with nearly equal certainty the reasoning from those facts has been governed by a wide knowledge of and a thorough appreciation of the related circumstances. In this case no exception is to be taken to the facts presented, but doubt is held as to your deduction that an increase in our appliances for handling sea freight would be of no service to the shippers of such freights, or that the cost of such service would be formidable, after commercial confidence in American shipping was restored.

EDWARD P. NORTH.

Pelham, N. Y., Aug. 26, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Will you permit a few words regarding your editorial on "Deep-Sea Trade in American Ships," in the issue of your paper of August 14? You present the facts regarding the difference in the cost of building ships in the United States and the foreign cost, with absolute accuracy. But your conclusion, it seems to me, is wrong. You say:

"The inevitable conclusion presents itself that any kind of legislation to enforce deep-sea trade in American bottoms is a species of class legislation, directed either at the shipbuilder or at the ship owner, but conferring no benefit on the shipper."

Were it not for our highly protective tariff, which abounds in specific instances of legislation helpful to a certain class, a great many prosperous American industries would have to be abandoned, if the higher cost of American production should be regarded as justification for turning it over to our foreign competitors. In a short time through the lack of employment our people would be forced to accept lower wages, and in the end they would be compelled to labor for wages on a par with those paid in foreign countries. This our people, by their adhesion to the highly protective tariff, seem determined not to permit. They seem determined to continue the higher American wage-rate, even if it does compel them to pay a higher price for the things they consume. You say that it confers no benefit on the shipper if legislation is enacted that will give us more American ships. What the shipper is looking for, surely, is a lower cost of getting his products to the consuming markets. If more American ships are built, their competition with foreign ships will be very likely to cause a reduction in freight rates, and thus the shipper will surely be benefited. If there are two ships seeking one cargo, the shipper makes the rate of freight to suit him; but if two cargoes are seeking one ship, the ship owner makes the rate of freight to suit

him. It is the operation of the inevitable law of supply and demand.

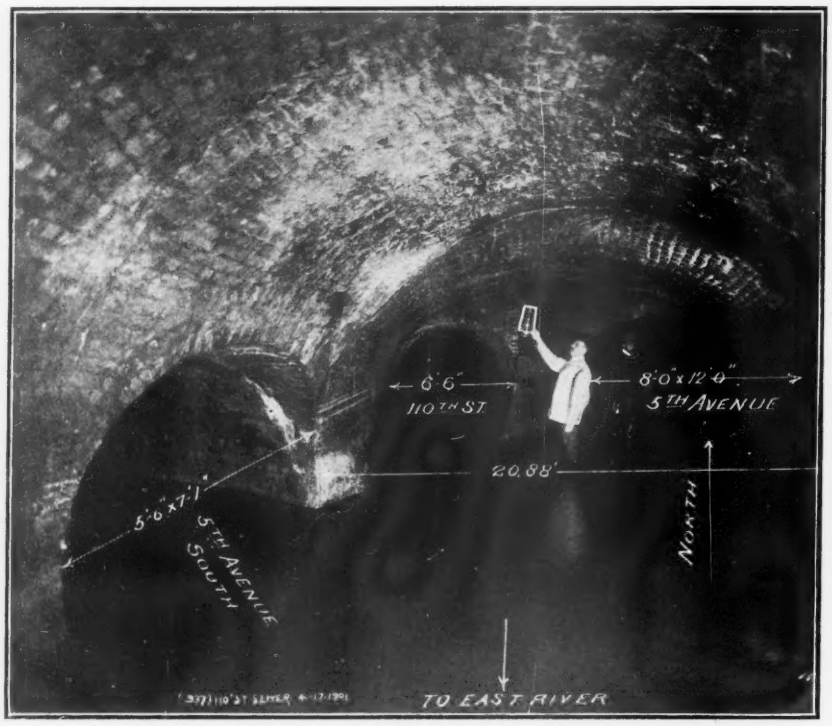
Again, is it not a short-sighted policy which leaves us dependent to the extent of over 90 per cent. upon the ships of foreign countries for the carrying of our vast and increasing exports? Is there not a possible danger lurking in such an absolute dependence upon foreign shipping? What a fearful thing it would be if the foreign countries whose ships do our carrying should become involved in war and withdraw their merchant ships from our trade. Still, again, the value of merchant ships and citizen seamen as an auxiliary arm of the national defense justifies extreme measures on the part of our Government to see to it that there shall be strength instead of palsy in that necessary arm of the national defense.

With American capital, as you suggest, owning a number of ships under a foreign flag, what particular benefit is conferred upon the country at large, considering that the ships are built by aliens, manned by aliens, commanded and officered by aliens? American capital receives the interest on the investment—possibly 5 per cent.; and foreigners receive the other 95 per cent. Would it not be better if the ships were owned by foreigners, if our people could build, officer and man them?

As I see it the economic advantage of our building our own ships, officering and manning them with our own citizens, is great; but the military value is infinitely greater. On that account it is to the Government's interest to see to it that we have them. I respectfully but earnestly ask you to consider the matter in the light of these suggestions and arguments. ALEX. R. SMITH.

[Mr. North's able presentation of the theory involved needs no reply, but the mathematical man in our employ believes that if, by some chance, British built vessels, owned by American iron producers, could trade on the lakes, the iron producers and consumers would pay less for freight than they do now, since cost of transportation could be lessened by smaller fixed charges and lower wages. The condition of affairs above described is highly imaginative, but illustrates the point. With Mr. Smith's statement that the shipper is looking for a lower cost of getting his products to the market, we are much in accord. Also, that it is cheaper for the shipper when several ships are seeking one cargo. But does not Mr. Smith know that not several, but many, ships are now seeking each cargo offered? The difficulty is that the American built and manned ships cannot compete with the others, and if we force such competition, we bring about the other hurtful state of affairs well described by the contributor as that of several cargoes seeking one ship.—Editor.]

Centers for Concrete Lining of Central Park Tunnel.



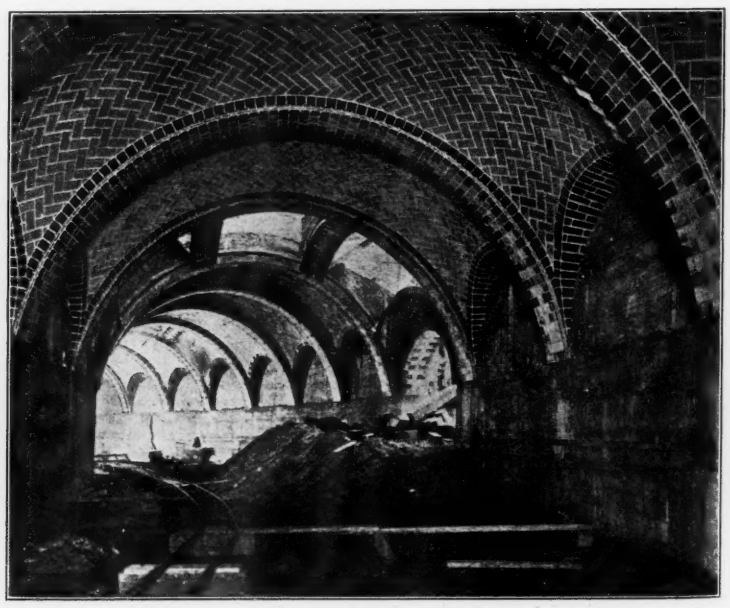
Sewer Junction, Fifth Avenue and 110th Street.

Report of the New York Rapid Transit Commissioners.

The second report of the Board of Rapid Transit Railroad Commissioners, for the year ending Dec. 31, 1902, has been published. The report is printed on heavy paper and fills a pamphlet of 372 pages, including a large amount of tabular matter, maps and photogravures. The commissioners consider that the year 1902 will rank as one of the most important in the rapid transit annals of Greater New York.

At the end of 1901 the Board had made a degree of progress towards the practical accomplishment of its ultimate purpose, which, in view of the numerous difficulties and the powerful obstructions it had met and of the financial conditions of the city during the first three years of its work, must, on the whole, be deemed highly satisfactory. But the concrete and definite results were limited (1) to the partial building of the Manhattan-Bronx railroad and (2) to the creation of the franchise for the Brooklyn-Manhattan railroad. The latter franchise practically illustrated the intention of the Board that the municipal rapid transit system should, as soon as financial conditions would permit, reach all the boroughs of the city. Especially was it the intention that the great Borough of Brooklyn, second in population and importance only to the Borough of Manhattan, should in respect of rapid transit receive attention no less than that accorded the Boroughs of Manhattan and the Bronx, which had had the advantage of the inauguration of municipal rapid transit within the limits of the former city of New York

Subdivision of Gas Mains at 66th Street.



City Hall Station.

Reinforced Concrete Construction, Lenox Avenue.

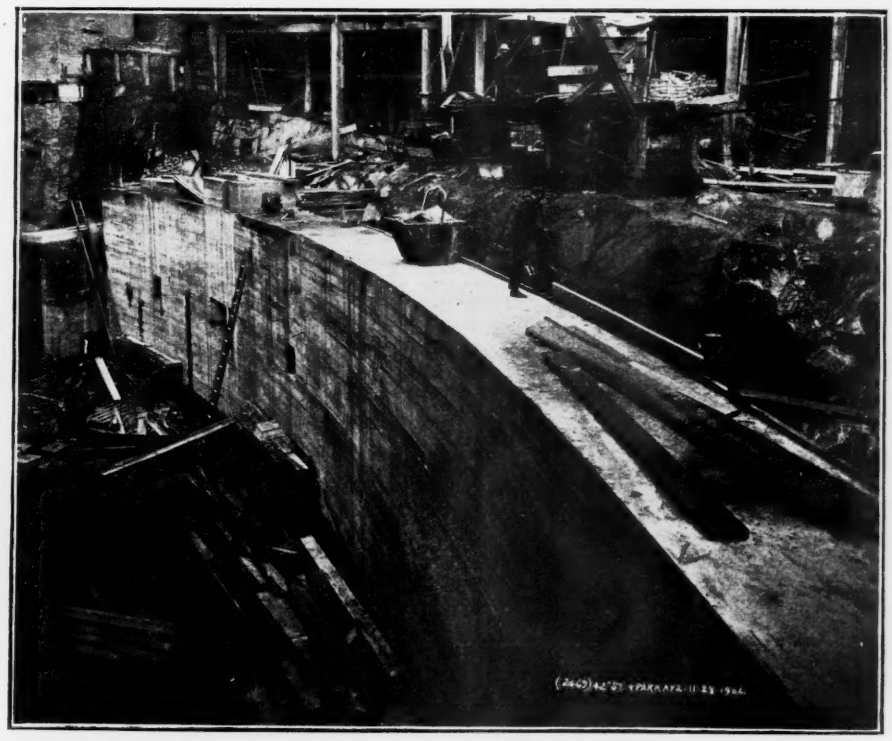
before its consolidation into the Greater New York. In 1902, however, the Board was able to establish the broader and farther reaching scope of its work and duty for which it had hoped since 1894, and especially since such municipal consolidation.

Mr. Orr calls attention to the fact that the year 1902 also saw the establishment of the fundamental principle that the use of the underground and overhead portions of the streets of New York for railroad purposes should proceed according to the harmonious and far-seeing plan; that the Pennsylvania terminal franchise was also granted, the same year; that the Brooklyn-Manhattan contract was made and additional tunnel connection was authorized with Jersey City. It was also ordered by the Board that a plan be prepared for a great and systematic extension of rapid transit facilities in all the boroughs except Richmond, this progress being the normal fruit of the rapid transit agitation which caused the existence of the Board in 1894.

In the future it is expected that the terms of municipal rapid transit contracts can be more favorable to the city than was the Manhattan-Bronx contract. That contract, as was pointed out in the first report of the commissioners, was made at a time when there was a widespread belief among railroad and financial people that the project was likely to be a financial failure and it was with great difficulty and after delay that the city was able to obtain a contractor. But the bid for the Brooklyn-Manhattan extension in 1902 came to between a quarter and a fifth of the estimated cost of the work, showing beyond doubt the very great value of the leases which the city would be able to offer to its municipality-built railroads.

The report for 1902 is divided into four topics. The first deals with the definite approval by the Legislature and acceptance by the city of the plan of a unified and harmonious development of all the rapid transit facilities. Assembly Bill No. 1,045, which was an act to amend the Greater New York charter by adding a section in relation to franchises for tunnels connecting with other railroads and forming a continuous line between points within New York City and outside of it, aimed to make possible the Pennsylvania project of securing a Manhattan terminal for the Pennsylvania and Long Island railroads and incidentally to connect the Boroughs of Manhattan and Queens by tunnels under the North and East Rivers. The Bill raised the question whether or not it was proper to grant a perpetual franchise even under the conditions attaching to the Pennsylvania project. The circumstances were unique. The company proposed to spend from 35 to 50 million dollars on a tunnel which would give Manhattan and Queens unbroken connection with the west and south, and to provide very desirable communication between Manhattan and Queens. The advantages of the plan to the City of New York were considered beyond estimation. It was clear that a tunnel of this character could never be built as an independent enterprise, and it was desirable from the railroad point of view only as a means of connecting the Pennsylvania and the Long Island system with Manhattan Island and with each other. There were many theoretical reasons against a perpetual franchise but the manifest difference of refusing a perpetual franchise to the Pennsylvania tunnel, and, for example, to the rapid transit subway was that if at the end of the period for which the subway franchise was granted the city decided to operate the railroad it could take over the entire railroad, but, in the case of the Pennsylvania tunnel, if the city assumed it at the end of a limited franchise it would acquire what would be of very little value without the outside railroad systems connecting with it, while the railroad would lose what would

Waterproofing Invert, 149th Street.



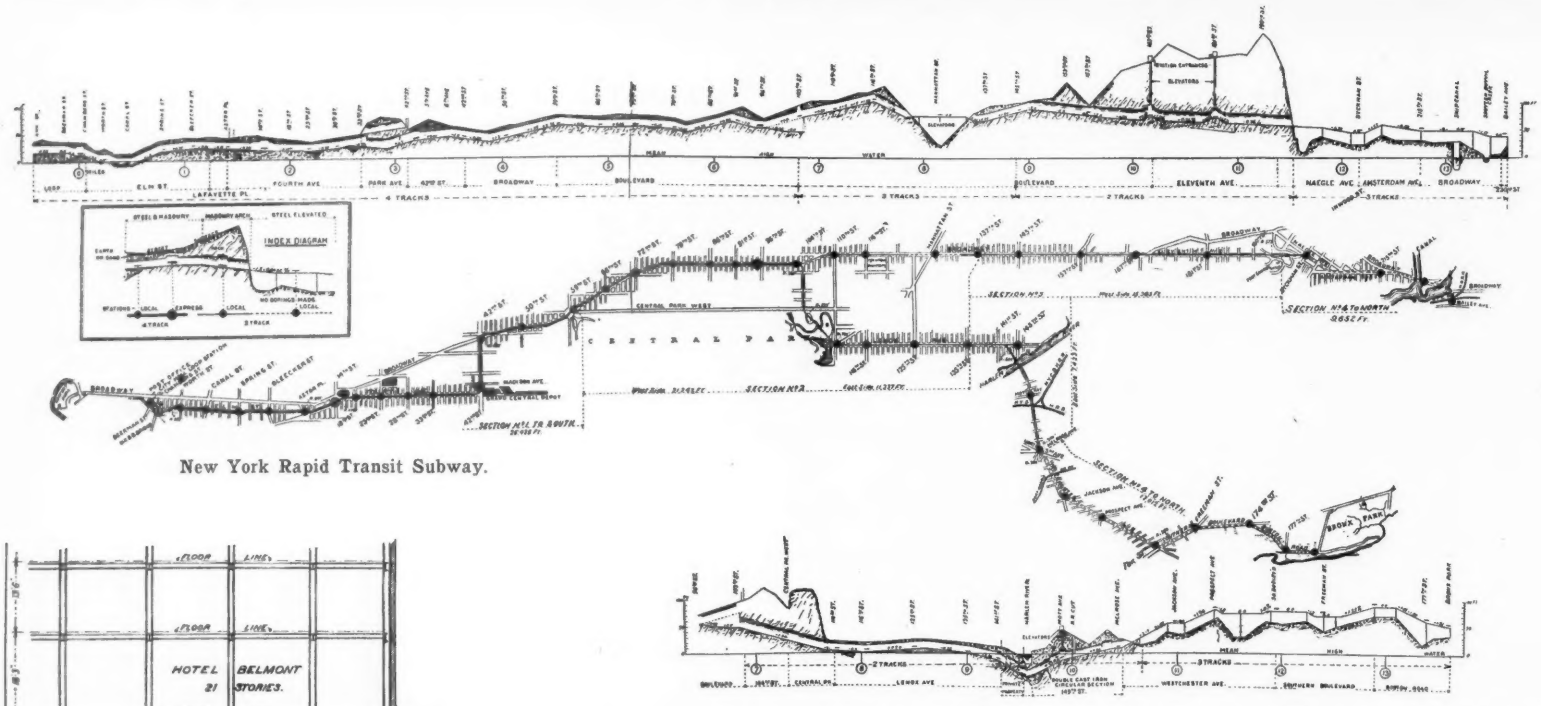
Concrete Retaining Wall at Hotel Belmont.

be vital to it after its business had been adjusted for 50 or 75 years to the use of such facilities. With this in view, Mayor Low accepted the bill on behalf of the city and Governor Odell sent to the Legislature an emergency message in behalf of its immediate enactment amending Section 32 of the Rapid Transit Act. This bill became a law and established beyond question the power of the Board to grant franchises such as that desired by the Pennsylvania.

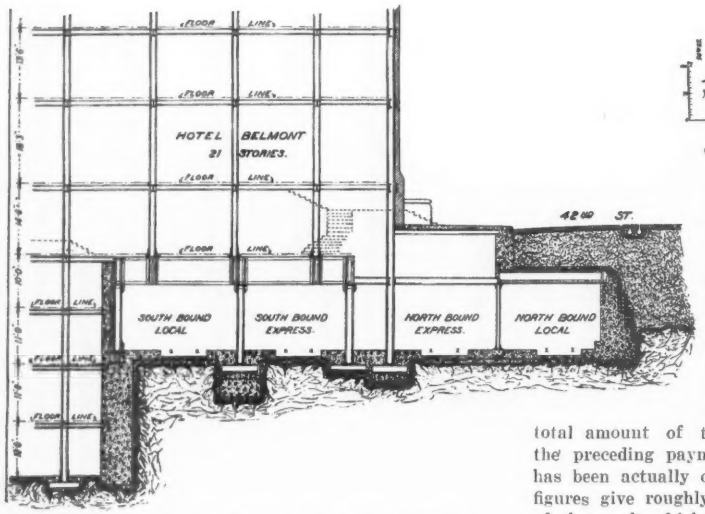
On May 5, 1902, President Cassatt, on behalf of the Pennsylvania, New York & Long Island Railroad Company, made application for the tunnel franchise. This was held up for a long time by the Board of Aldermen but was ultimately approved on December 16 and signed by Mayor Low December 23. Franchises for a street railroad tunnel to Jersey City were also approved by the Aldermen and the Mayor.

The portion of the report dealing with future rapid transit states that as result of the exceptionally favorable bid which was mentioned as received for the Brooklyn extension, amounting to a fourth or fifth of its estimated cost, the Board was enabled immediately to take up the consideration of building an additional tunnel to Brooklyn, plans of which are now being worked out by the Chief Engineer. His instructions are to prepare and submit to the Board routes and general plan of a rapid transit railroad to connect the general region of City Hall Park, Manhattan, as directly as possible with the general region of Borough Hall Park, or some other equally convenient passenger transportation center in Brooklyn. The general scheme for future rapid transit extensions for the whole city has already been printed in these columns.

The contract for the Brooklyn-Manhattan rapid transit railroad follows in general the form of the Manhattan-Bronx contract, but some provisions have been inserted



New York Rapid Transit Subway.



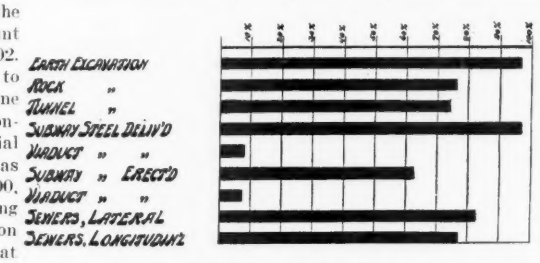
Corner Forty-Second Street and Fourth Avenue.

more favorable to the city than were inserted in the Manhattan-Bronx contract. The contractor must undertake to build the entire railroad, with its appurtenances, and to provide the original equipment within three years, and must also undertake the obligation of hiring the railroad upon a lease for 35 years with the privilege to the contractor of a renewal for 25 years. Connections to be furnished with other rapid transit or surface lines and continuous trips without change of cars for a single fare not exceeding 5 cents must be stated in the bid. A further new provision is that a bidder must state the maximum fare to be charged by him upon the railroad within the limit of 5 cents. The amount of the fare becomes, therefore, an additional element of the competition. Contract was let to the Rapid Transit Subway Construction Company on July 24, 1902, for $2,000,000 for construction and $1,000,000 for terminals, and work was formally begun in front of No. 17 State street, Manhattan, on Nov. 8, 1902.

Progress on the Manhattan-Bronx railroad has proceeded rapidly through the year and the total expenditure was $11,436,000, making a total to date of $23,464,000. The total amount of the contract is $35,000,000, and as the preceding payments have been made only as work has been actually completed or materials furnished, the figures give roughly the proportion of the total amount of the work which had been done at the close of 1902. The accompanying photographs are devoted entirely to the Manhattan-Bronx line and show what had been done in the period of 34 months since the signing of the contract, and in approximately 33 months since the official announcement of the work on March 24, 1900; but, as active operations did not begin until about Sept. 1, 1900, owing to the delay in making sub-contracts and collecting the plant, a space of 28 months represented the duration of actual work at the close of 1902. It was hoped at that time that the greater part of the railroad would be in operation before the close of the present year, although the contract allows four and one-half years for completion. The strike occasioned some delay, however. According to the estimate of the Chief Engineer 98 per cent. of the earth excavation, 76 per cent. of the rock excavation, and 74 per cent. of the tunneling had been completed Jan. 1, 1903, and of the 41,876,000 tons of steel required for the subway 40,678,000 tons, or 97 per cent., had been delivered. The accompanying diagram shows the percentages of work completed.

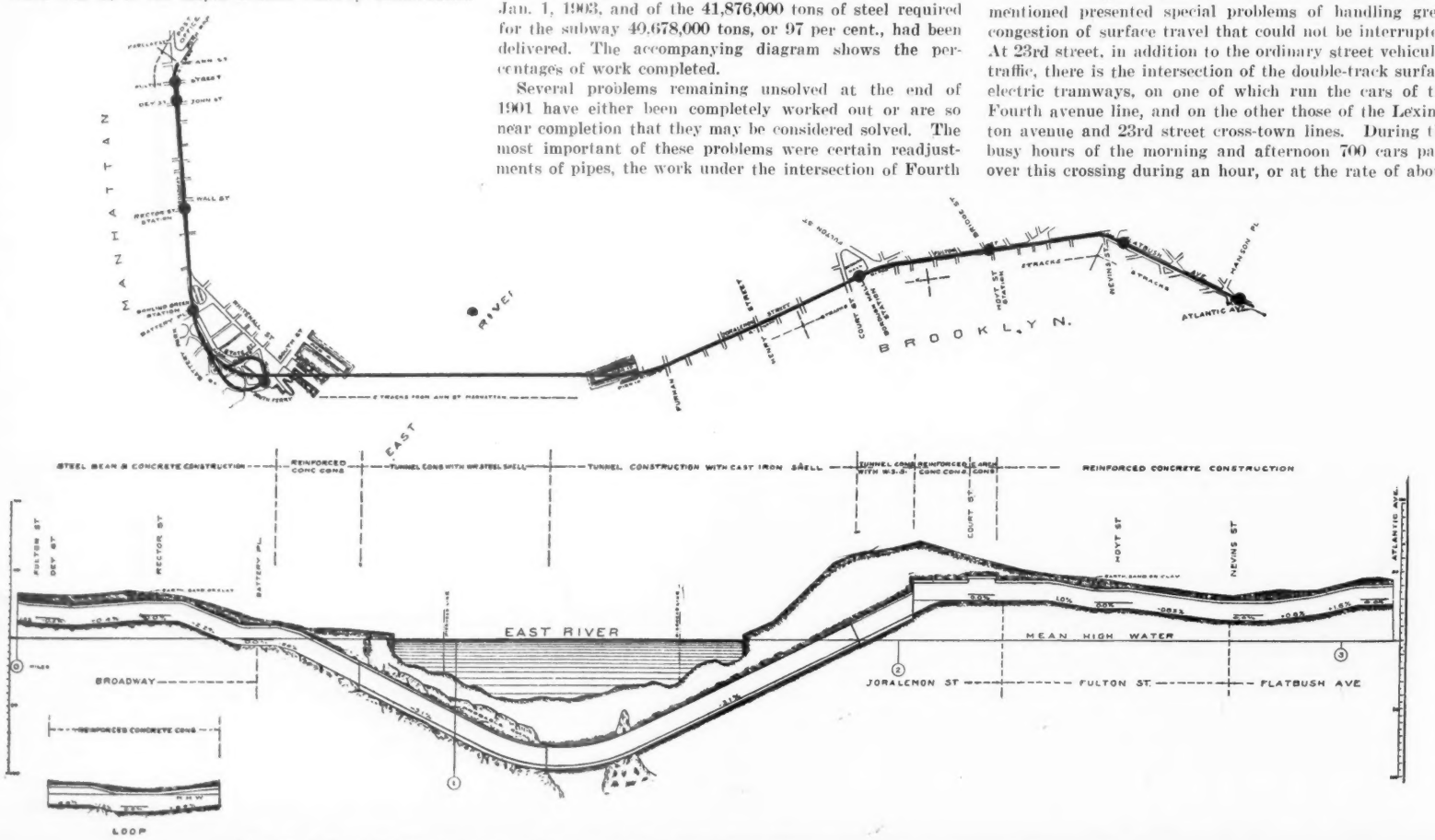
Several problems remaining unsolved at the end of 1901 have either been completely worked out or are so near completion that they may be considered solved. The most important of these problems were certain readjustments of pipes, the work under the intersection of Fourth avenue and 23rd street and of Fifth avenue and 42nd street and the tunnel under the Harlem River.

All of the intricate pipe readjustments have been either constructed or satisfactorily planned. Some of these involved radical alterations, as is shown in a typical example at Broadway and 66th street, where there were two gas mains, one 36 in. and the other 30 in. in diameter. As the subway had to be kept close to the surface in order to accommodate the station at 66th street, and also to cross over a sewer at 65th street, there was not room enough to pass these large gas mains over the roof of the subway and beneath the conduit of the surface railroad. The mains were, in consequence, sub-divided into five mains of 24 in. in diameter, and each one laid in a separate trough between the roof beams. This construction, which is in accordance with the original plans, has been carried into execution during the year.

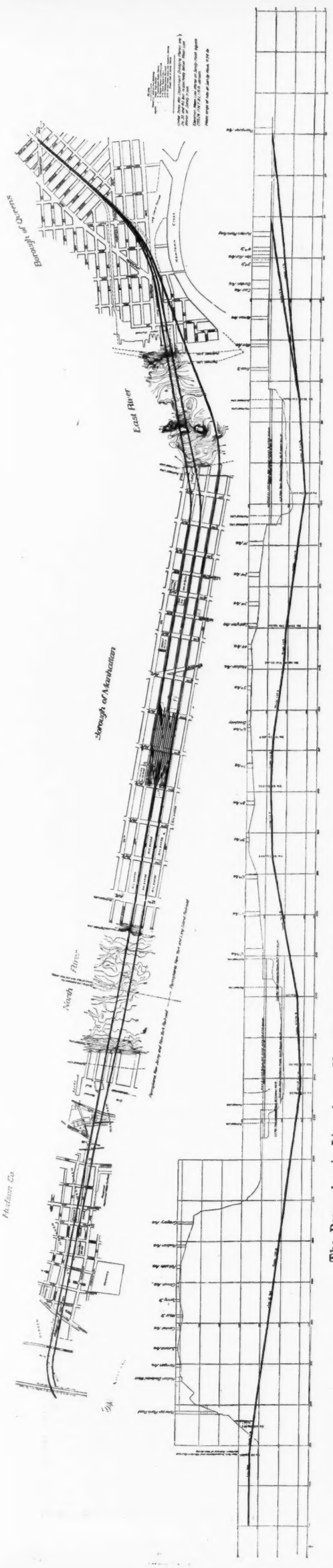


Percentage of Work Finished.

The crossings at 23rd street and 42nd street above mentioned presented special problems of handling great congestion of surface travel that could not be interrupted. At 23rd street, in addition to the ordinary street vehicular traffic, there is the intersection of the double-track surface electric tramways, on one of which run the cars of the Fourth avenue line, and on the other those of the Lexington avenue and 23rd street cross-town lines. During the busy hours of the morning and afternoon 700 cars pass over this crossing during an hour, or at the rate of about



New York Rapid Transit Subway—Line and Profile from Post Office, Manhattan, to Atlantic Avenue, Brooklyn.



The Pennsylvania Line Across New York City (Pennsylvania, New Jersey & New York Railroad and Pennsylvania, New York & Long Island Railroad).

one car every five seconds. The problem was further complicated by a network of water and gas pipes, and an intricate arrangement of electrical conduits.

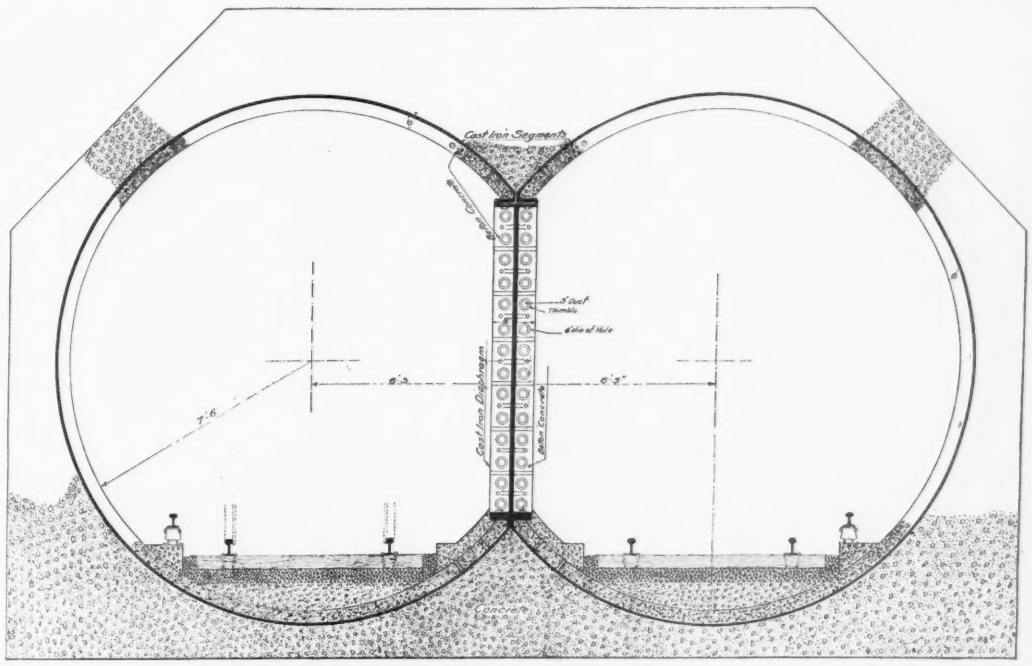
As soon as the pavement was removed, timbers were laid carrying planks extending over the whole area of the street between the curb lines, and beneath this planked surface the work of excavation and construction has been carried on. The various water and gas mains, which were found in a veritable tangle, will be relaid in a systematic order, those running north and south in one plane, and those east and west in another. There will not, however, be room enough above the roof of the subway for the electric conduits of the 23rd street railroad cross lines. These conduits are very numerous, containing 54 cables, carrying power from the generating station at 25th street to the Broadway and other lines. A special large conduit for such cables, 6 ft. high by 4 ft. wide, has been built beneath and transverse to the Rapid Transit Subway.

The problem at Fifth avenue and 42nd street was similar, except that at this point there is but one tramway, on 42nd street, but on the other hand, there is found on Fifth avenue the greatest congestion of vehicular traffic to be met with in New York. In addition to the usual number of gas pipes, water mains, sewers and electric conduits, there are two 36-in. and two 48-in. water mains running down Fifth avenue. As at 23rd street, this intersection has been planked and the excavation carried to a depth of 39.5 ft., of which 17.5 ft. were in very hard rock. The large water mains were supported by specially designed trusses.

At the Harlem River, as was explained in the last report, the sub-contractor elected to make an attempt to build the river crossing without resorting to compressed air, or at most, to very moderate pressures. The United States authorities having required that a minimum depth of 20 ft. of water be left clear at low tide, this fixed the elevation of the tunnel roof. Instead of using a shield or some of the well-known methods requiring compressed air, the sub-contractor excavated the river bottom to about grade level by means of a dredge. The material thus removed was mud with clay beneath. When the excavation had been completed he drove very heavy (12-in.) tongued and grooved sheet piling, and then fixed cross braces in place by the aid of divers, the expectation being that such sheeting would be sufficiently tight to prevent leakage. This work of preparation and installation of temporary false work has required a large expenditure of money and a year in time, so that it was not until December, 1902, that pumping was begun. At the close of the year this was sufficiently advanced to indicate that the attempt will be successful, and that the trench will be substantially free from water, although the external hydrostatic pressure will be 48 ft. The tunnel approaches will now be built in an open excavation, the sides of which will be protected by the sheet piling, in the same manner as the other subway construction. Under the river channel, which for navigation must be kept open, but which the Government will permit to be temporarily narrowed, the plan above described will be modified so that the excavation will be roofed over with heavy timbers to exclude water, as does the sheet piling at the sides. Provision has been made to install air pressure at this point if it be found necessary.

During the year two untoward accidents occurred. The first was an explosion of dynamite in the powder house at the head of the shaft at Park avenue and 41st street. At noon on January 27, one of the workmen discovered the house to be on fire, when almost instantly the explosion followed. As the man nearest to the house—and who alone possessed definite information—was killed, it has been impossible to learn the exact condition of affairs, and the amount of dynamite on hand. It is believed that the latter was between 200 and 300 lbs. The result of this explosion was to throw down much plaster in the Murray Hill Hotel, the immediately adjacent building, and to break every window in the houses in the close vicinity, and even some windows at a distance of 600 ft. No structural damage was done to any building or to the subway. Unfortunately five persons were killed and many injured, the latter being struck by pieces of flying glass or plaster, but such injuries were for the most part slight. Of those killed, one was a workman; the others were in the Murray Hill Hotel, one being an employee.

The second accident was a sliding forward of a stratum of rock in the east wall of the east tunnel under Murray Hill at a point between 37th and 38th streets. This part of the subway is in tunnel, the rail level being about 60 ft. below the street surface. The work of driving the tunnels, for there are two, each containing two tracks, was by the bottom-heading method. At the point in question the bottom for nearly the full width and for about 10 ft. in height had been removed, the rock being very hard and to all appearances quite sound. On March 20 there was a fall of rock in the roof, and on March 21 a fall in the side, one of the strata which had an inclination of 45 deg. sliding forward, disclosing the fact that, instead of the rock being solid and sound as appearances indicated, there was but a thin shell of hard rock outside of the line of the excavation, behind which was a mass of decomposed rock of no tenacity. As soon as the rock shell was broken this decomposed rock fell, the break extending to the surface and next to the walls of the abutting houses. As a result the front walls of four houses were so damaged that they had to be removed. This accident was not attended by any personal loss or injury.



Harlem River Tunnel—New York Rapid Transit Subway.

The break in the ground had a length of 35 ft., and a width on the surface of about 20 ft. The void thus formed was filled with material excavated on other sections, consisting of earth and stone, which, with the broken pieces of the rock itself, formed a loose mass of material presenting great difficulties for tunneling operations, especially as any further movement of the ground was to be prevented if possible. To complete the work by open excavation was no more encouraging, for the removal of the superincumbent material would take away the abutment support of the street railroad tunnel, which is above and only a few feet to the west of the Rapid Transit Subway. As the former structure was an old brick arch, already cracked, no risk could be taken with it. The contractors finally decided to pump Portland cement grout into the broken mass with a view not only of cementing it together, but also to fill all the voids so as to permit pieces of rock to be removed without taking away all the support from other pieces resting on them. About 1,900 barrels of cement were thus pumped in, the tunnel itself having been bulkheaded to prevent the grout from running away. Of this amount about 1,100 barrels were effective, the remainder being lost in leaks. After this grout had been given a chance to set, two side drifts 10 ft. high and 7 ft. wide were opened, in which the permanent masonry side walls of the tunnel were constructed. A top heading along the crown of the arch was next driven, from which, working laterally and downwards, the excavation was completed to the side walls. At this point both the side walls and the arch have been given an increased thickness. The experiment of grout was found to work admirably, for it not only filled the large voids but penetrated into all the fine crevices, so that the material, which before grouting was quite loose, required blasting for its removal. Before the end of the year the excavation at this point was completed and arched with masonry without any settlement of the ground above.

The excellent results attending the construction in concrete that we have been employing for two years gave confidence to the hope that a combination of rods and con-

crete would afford advantages over the ordinary combination of concrete and beams. With this view, a design was prepared for a section of subway with the walls and roof consisting of rods imbedded in concrete, the tensile strains to be taken by the former and the compressive by the latter. Columns were introduced between the tracks, as in the standard plan, to the tops of which rods were attached both transversely and longitudinally.

The site selected for carrying this design into execution was in Lenox avenue between 138th and 142nd streets, adjoining the approach to the Harlem River tunnel, where the subway has two tracks and is located between the surface car tracks and the curb, thus affording freedom for work. As the bottom of the excavation at this point is about 14 ft. below water level, it was found necessary to reinforce the bottom concrete with rods in order to withstand the upward thrust of the hydrostatic pressure. So successful was the experiment, not only in quality of work produced but also in rapidity and lessened cost of execution, that it has been decided to apply the same principle of design to the Lenox avenue extension from 142nd to 148th streets, the station and subway extension at 149th street and Third avenue in The Bronx, and to portions of Contract No. 2 in Brooklyn.

Reinforced concrete has also been used elsewhere, in strengthening arches and sidewalls where extraordinary or uncertain stresses were liable to occur; in stiffening the bottom against upward pressures, and in vault lights. Expanded metal for the same object was introduced in the arch and wall of the Murray Hill tunnel wherever the ground was treacherous.

During the year the question of the designs for station decoration and interior arrangement has been very fully considered by the consulting architects, Messrs. Heins & La Farge, in company with the Chief Engineer. The task of preparing suitable designs has been by no means light. There are 38 underground stations, varying in length from 200 to 350 ft. The large area of walls and ceilings to be thus covered precluded the use of many materials, either on account of expense or the difficulty of procuring them in sufficient quantity, although such materials were otherwise very desirable. Many designs were prepared, and even some sub-contracts let and subsequently canceled. At length a general principle was established that is now being followed, and in accordance with which four stations (City Hall, Bleecker street, 28th street and Columbus Circle) are already under finishing treatment, while plans for several more are ready for sub-contracts. Although a general principle of design has been laid down no details will be repeated, so that no two stations will be alike. This, it is hoped, will produce a pleasing variety in effect. The main features of the design are floors of concrete for the platforms; walls of brick, enameled tiles, faience or terra cotta; and ceilings of plaster. The base of the walls for a height of about 30 in. will consist of very hard vitrified but light colored bricks to withstand the rough treatment that such portions of the walls are certain to meet. Above this brick base the main treatment of the surface will be white tiles, but divided into panels by decorative work in colored tiles, faience or terra cotta. The name of the station will be boldly displayed by large decorative tablets at intervals, and the number of the street, if numbered, or the initial letter, if named, will be worked in the design of the cornice at shorter spaces of about 15 ft. This will greatly facilitate passengers in recognizing stations from car windows.

The walls and ceilings will be built, according to the specifications, with an air space at the back. In the case of ceilings this will be done by making them in plaster on wire lath, either flat or in a series of arches, by bending the wire lath in curves parallel to, but at a slight distance from, the roof concrete.

The electric lights will be set in recesses, and all plumbing pipes and electric wires will be built in out of sight.

Steel Frame Side-Door Suburban Car for the Illinois Central.

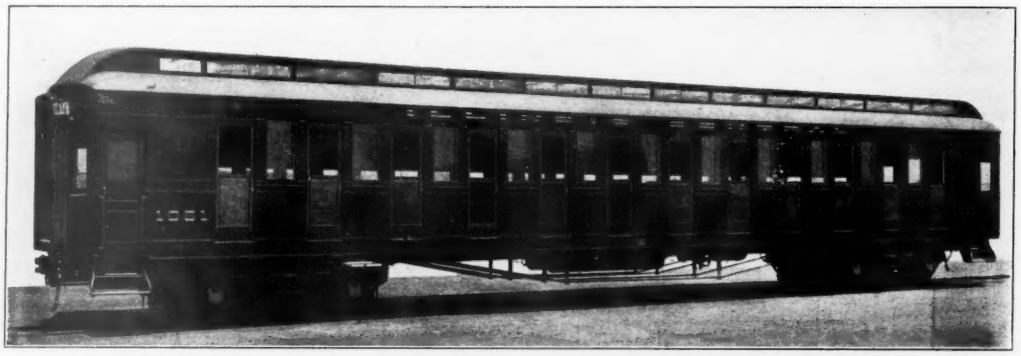
The unusual interest in the steel-frame side-door suburban passenger cars, recently put in service by the Illinois Central, is due not only to the novel mechanical features, but to the effect this type of car will have upon safe, rapid and efficient transportation of dense passenger traffic and especially the protection against fire, resulting from the exclusive use of steel in the underframe. It has been the policy of the company for years to improve and develop the suburban schedules, and its officers have made a special study of the subject. During the World's Fair at Chicago in 1893 it transported safely 19 million passengers, mostly in side-door cars, and the experience then gained has been applied to the improvement of its regular service.

Usual designs of side-door cars have separate compartments in which the seats are arranged transversely from side to side, with no communication between the compartments, each of which has doors swinging outwardly over the station platform. This style of car is still in general use in Europe and Great Britain, but offers no advantage over the end-door car used in America, as it is even slower in its operation. In fact, the disadvantage of the side-door car as used in England is so great that some English roads contemplate using the end-door car.

The Illinois Central cars have sliding side-doors operated and controlled by mechanism within the walls of the car, so that all the doors may be opened and closed together or separately by the trainmen from either end and both sides of the car. The abolition of the interior compartments and the opening of side aisles are also noticeable features. Passengers desiring to board English cars must go along the station platform, loking first into one compartment and then another until vacant seats are found. The new cars have aisles extending the entire length on both sides of the car, and passengers may enter any side-door and pass along the aisles or through the communicating end-doors of the vestibules to other cars where seats may be found, the train meanwhile having started.

The limitations of end-door cars have become apparent, as demonstrated by the detentions at stations during rush hours. The number of trains at such time is usually increased but this does not afford relief because of the crowding of passengers at the ends of the cars. Under these conditions the remedy lies in preventing the formation of crowded groups at the ends of cars, and of distributing the passengers evenly over the length of the station platform, so that when trains arrive passengers may step to the side-doors and avoid the movement up and down the platform to get opposite the end entrances at their more or less uncertain points of stoppage.

The new cars have 12 sliding side-doors on each side space 5 ft. from center to center throughout the length of the car, each door being directly opposite a section of eight seats, with aisles on both sides just inside of the doors extending the length of the car. This design will facilitate train movement and increase the capacity of the road. As between an end-door and a side-door car the relative quickness of movement in receiving and discharging passengers is represented by the relation of the length to the width of the car and the number of doors available. In a car 60 ft. long with two end-doors, passengers may leave the car in single file at the rate of one per second from each door, requiring 30 seconds to empty the car, whereas in a car 10 ft. wide with 12 side-doors, passengers may leave the car at the rate of one per second from each door, requiring but five seconds, or one-sixth of the time, to discharge the same number of passengers. The steel-frame car is also from 6,000 to 10,000 lbs. lighter than cars of the same size of the standard wooden construction.

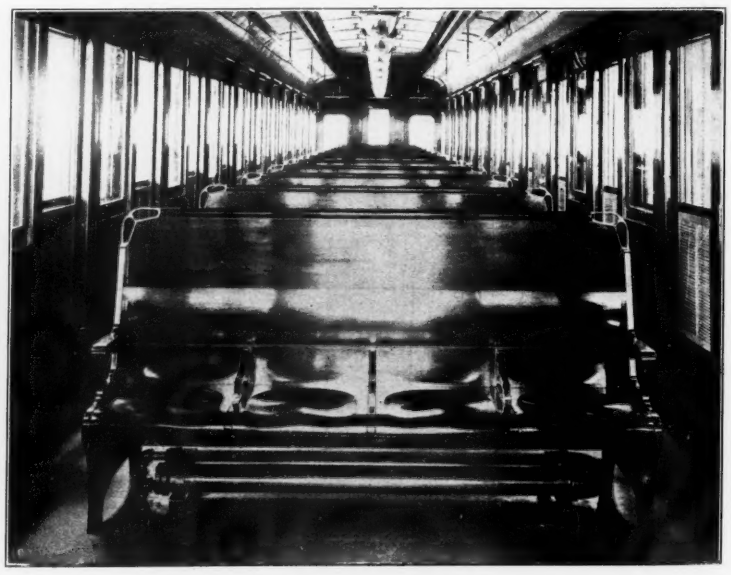


Exterior View of Illinois Central Suburban Car, Showing Side Doors Closed.

This new type of car is the result of careful study, based upon long experience in the handling of a large suburban traffic on the part of Mr. A. W. Sullivan, Assistant Second Vice-President, and of Mr. William Renshaw, Superintendent of Machinery, of the Illinois Central, who have designed the car.

The underframe of the car consists of four 21 lb. 9 in. steel I beams, 64 ft. long, spaced nearly equal distances apart and of a total width over the flanges of 10 ft. 4 in. The end sills are 25 lb. 9 in. steel channels set with backs to the squared ends of the longitudinal sills and riveted to them with double angle plates reinforced by gussets. Four truss rods passing over the inner body bolsters and anchored to the outer body bolsters, are used to support the middle of the car. These rods are solid, that is, without the usual swivel connection in the middle; their adjustments being obtained by eight vertical screw queen posts resting with their lower ends upon the rods and their upper ends supporting two 15 lb. 7 in. steel I needle beams extending entirely across the car under the sills, with their upper flanges riveted to the lower flanges of the sills, thus bracing as well as supporting the underframe. Over the body bolsters and over the needle beams are placed 12¼ lb. 6 in. I beams in short sec-

Manhattan Valley Viaduct.



Interior View of Illinois Central Suburban Car.

tions between the longitudinal sills as stiffening members and riveted with angles to the webs of the sills.

Upon the metal sills, a steel floor of ¼ in. plates, 60 in. wide, is laid with butt joints formed by the planed edges of the plates. The floor extends across the underframe. This floor is riveted to the upper flanges of the sills with double rows of ½ in. rivets. There is thus obtained a continuous metal surface extending the entire length and width of the car, insuring perfect rigidity of the underframe and giving complete protection from fire underneath the car.

The underframe is carried upon four body bolsters made of 7 in. x 1 in. steel bars in the upper and lower members. The bolsters are arranged in pairs, 4½ ft. centers, and bolted to the lower flanges of the sills. Heavy truss connections extend between the bolsters, to which are bolted the center plates.

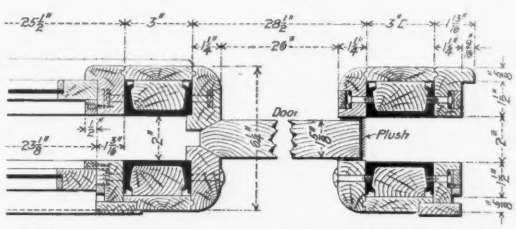
Four-wheeled trucks of standard construction for passenger service are used, with rolled steel wheels, 33 in. in diameter, and steel axles with 5 in. x 9 in. journals.

The cars are equipped with Standard steel platforms and couplers, and the Sessions friction draft gear. A novel method of attaching the draft rigging to the car has been adopted because of the distance (38 in.) between the center sills of the car. This attachment consists of a steel plate, 2 ft. 5 in. x 3 ft. 6 in. x ¾ in., which is placed between the main sills of the underframe and the sub-sills of the platform and is bolted through their flanges with 24 ⅝ in. bolts, accurately turned to reamed holes with a driving fit.

The upper frame is made of 4 lb. 3 in. steel channels with solid forged ends, which are riveted at the bottom to the top flanges of the side sills, and at the top to an iron plate, 4½ in. x ½ in., which extends in one piece throughout the length of the car and the vestibules. The channels are spaced to form the window and door posts, and are set back to back 2 in. apart so as to form hollow side walls, within which the doors slide. Below the windows a girth brace of 1¼ in. angle is riveted to the posts with gusset connections, to which the diagonal bracing of 1¼ in. angle and 1¼ in. x ¼ in. flat steel is riveted; this bracing at the lower end is shaped to form a foot, which is riveted to the lower part of the channel post and to the top flange of the side sill, thus reinforcing the post in its connection with the sill and forming a braced panel between each of the side-door openings. The corner posts consist of two 5¼ lb. 4 in. channels set transversely on the side sills and spaced 11 in. apart. On the outside and inside of these posts four triangular gussets of ¼ in. x 15½ in. steel plate are riveted to the flanges, tying them firmly together; the corner posts are riveted to the side sills and to the upper plates with angle connections.

The space between the corner posts and the adjoining side-door posts is braced with a double set of diagonal bracing, formed of 1¼ in. angles in three vertical panels and riveted to the gusset connections. This arrangement of corner bracing gives stability to the upper frame and forms a collision bulkhead of great resistance. Across each end of the car the corner posts are connected by ¼ in. gusset plates to 5 in. x 4 in. x 7/16 in. angles and support oak end plates, to which are secured the side arms for the buffing mechanism of the upper portion of the vestibule diaphragm plate. Diagonal braces of 5¼ lb. 4 in. channels are riveted to the corner post and to the extreme end at the side plates, which extend beyond the corner post of body to the corner post of the vestibule carried by the platform end sill. The vestibule corner posts are further reinforced by upright angles ⅜ in. x 2 in. x 2½ in. with flanged ends, which are bolted to the platform sills and at their upper ends riveted securely to the side plates and the end braces.

The carlines are ⅜ in. x 2 in. iron and are placed directly over each set of side-door posts, each carline resting directly on the side plates and secured thereto at each end by four ½ in. rivets, which pass through the forged foot of the carline, the plate and the forged ends of the channel door posts, tying them all together.

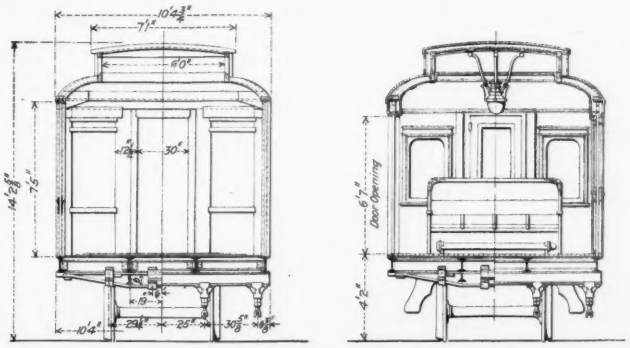


Horizontal Section Through Door and Window Posts.

There is thus formed a continuous connection of metal framing throughout the entire body of the car.

The exterior finish is poplar sheathing in vertical tongued and grooved strips, 2½ in. wide. The interior finish is mahogany panels inlaid with delicate border design in marquetry, and is continuous throughout the walls and the vestibuled ends of the car.

A unique method of securing the exterior and interior finish to the metal frame has been adopted. Within the hollow of the channels forming the posts of the side-doors and windows, strips of hard maple, 1½ in. thick and neatly fitted to the channels, were placed before the posts were assembled; the channel posts were then placed in a chuck upon the bed of a planer with the maple filler upwards, and with a specially designed tool the upper edges of the channel flanges were split to a depth of 3/16 in. and the inner portion of the flanges rolled down cold and turned over onto the filler, compressing and firmly enclosing it within the channel walls without the use of screws or bolts, thus making the filler an integral part of the channel and affording a secure and permanent foundation for attachment in the usual manner of the exterior and interior finish. Between the channel posts below the windows, horizontal nailing strips of oak, 1½ in. x 3¼ in., are tightly fitted and bolted to the metal frame, and on top of the metal plate, nailing strips of hard pine (1½ in. x 4 in.) are tightly fitted between the metal carlines and bolted to the plate.



Cross Sections of Illinois Central Suburban Car.

Between the door posts, threshold plates of malleable iron are tightly fitted, with curved lugs hooked over the outer flanges of the side sills. The inner edge of the plate is screwed fast to the floor. There is thus formed a secondary system of continuous horizontal bracing throughout the walls of the car, adding materially to the resistance offered to a raking, corner or end thrust above the level of the floor. On each side of the metal carlines nailing strips of poplar, 1¼ in. x 2¼ in., are bolted and framed into the deck sills and plates and to the nailing strip on top of the wall plates. The roof is 12/16 in. poplar, nailed to the strips in the usual manner. The floor is laid in three courses: first the steel plates forming part of the underframe, upon which is laid over the entire surface a covering of asbestos ¼ in. in thickness, and upon this a light flooring of wood is laid crosswise in tongued and grooved strips, ⅜ in. x 2¼ in., and bolted to the steel floor underneath.

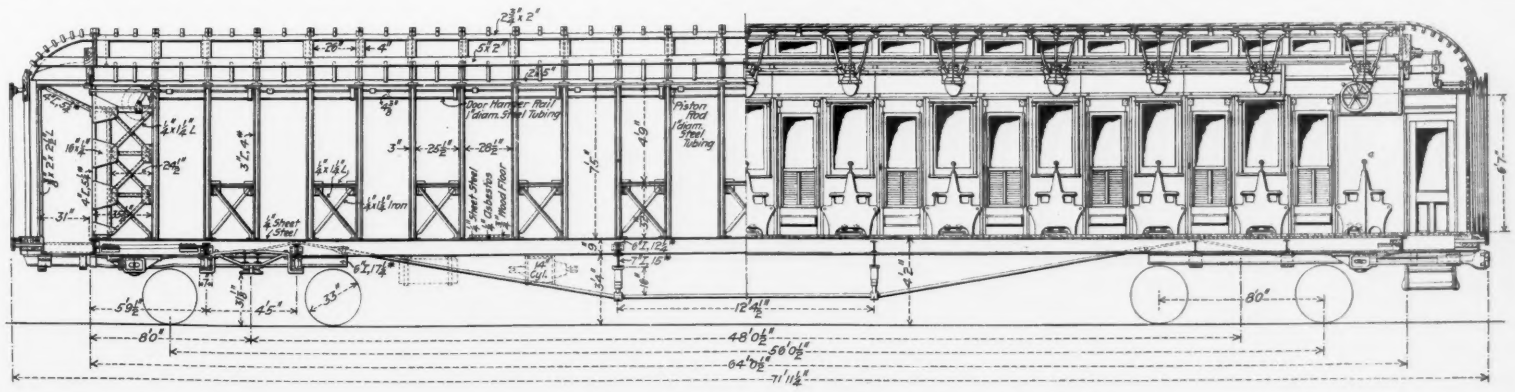
The interior of the car is open throughout its entire length to the end platform sills of the vestibule, the floor of the car and the vestibules being continuous, thus permitting the space of the vestibules to be utilized as a part of the interior of the car. The platform lids open against the ends of the car, and the vestibule side-doors swing across the ends of the side aisles to serve as a barrier to passengers walking into the opening for the vestibule steps. Provision is made in the seating arrangements for a passage around the vestibule side-doors so that the steps can be approached in the usual manner when the vestibules are used by passengers leaving the car at places where the station platforms are on the ground level. The vestibules are also provided with swinging end-doors to close the ends of the car and to afford passage from one car to another.

The seats are an entirely new design, in bench form, arranged transversely in sections, each section seating eight passengers. They are made throughout of mahogany, with straight backs 42 in. high, provided with swell panels for back rests. No upholstering is used. The seat bottoms of solid mahogany are molded form and mounted on trunnion bearings in front and supported on springs in the rear—each passenger having an independent seat separated from adjoining seats by short arms. There are 12 sections of seats, with two additional seats at each end of the car, making a total of 100 seats.

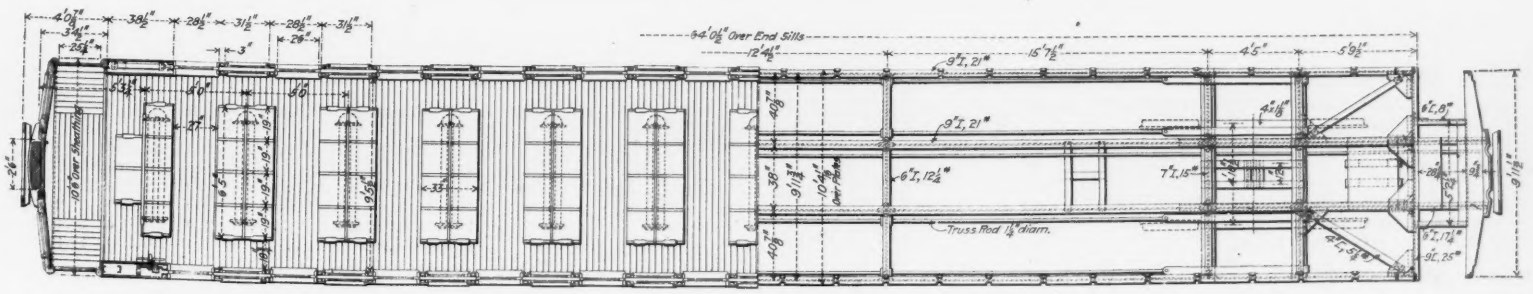
Between the seat ends and the walls on each side of the car is an aisle 16 in. wide, extending the entire length of the car, connecting with the vestibule area.

Opposite each section and directly in line with the section aisle is a side-door on both sides of the car, making a total of 24 side-doors, 12 on each side. The doors are mounted at the top on ball-bearing rollers and slide in and out of the spaces in the walls of the car. The thresholds are flush with the floor, equipped with safety treads and grooved to receive the lower ends of the doors. The side-doors are connected by mechanism concealed within the hollow walls of the car, and arranged to be operated in series by compressed air or by hand. The controlling mechanism is at the ends of the car and is operated by the trainmen. The mechanism is arranged so that the doors can be operated by either of two systems—that of the positive opening, closing and locking of all the doors on a side at one time, or the closing, locking and unlocking of all the doors at one time, leaving the opening of such doors as are to be used to be done by the passengers from either the inside or outside of the car.

The side-doors are provided with sliding sash and blind self contained, so that any adjustment of the sash or the blind can be made without interfering with the move-



Half Longitudinal Section and Side Framing—Illinois Central Suburban Car.



Half Floor Plan and Framing—Illinois Central Suburban Car.

ment of the doors, the maximum opening of the glass sash in the doors being 21 in. x 30 in. To insure a tight joint when the sliding side-doors are closed the front edges of each door are beveled and trued to fit closely into similarly beveled edges of the door strips, making an air-tight fit without the aid of weather strips. At the rear the square edges of the doors are made to fit closely by strips of plush or felt, which also prevent rattling.

The unusual height of the side walls has made it possible to carry the glass in the doors and windows to a height of 6 ft. above the floor, thus giving an outside view to standing passengers without the necessity of stooping. Another convenient feature resulting from the use of side aisles is found in the arrangement of the roller shades and blinds in the windows and doors, which in their drawn position leave exposed a strip of the window glass 10 in. high and extending the entire length of the car on the line of vision of the seated passengers, so that a clear view of the outside can be had at all times of the day without exposing the passengers to the direct rays of the sun.

The deck sashes are fitted with opalescent glass and operate in series by means of levers, one at each corner of the deck.

The ceiling is canvas covered veneer, painted a light shade of green to harmonize with the interior finish of polished mahogany.

The ceiling of the lower deck is mounted in hinged sections 5 ft. long to admit of ready access to the door operating mechanism within the side walls of the car. The mouldings forming the upper and lower edges of the movable ceiling panels also serve as racks for the display of advertising cards.

Pintsch gas is used for interior lighting, the lamps setting about 18 in. lower than is usual to give a better distribution of light for reading. This arrangement is made possible by placing the lamps over the backs of the seats, one lamp of three burners being used for each section, and quite out of the way of passengers using either the side or cross aisles when entering or leaving the car.

Arrangements for heating are provided by direct steam from the locomotive, the system of the Safety Car Heating & Lighting Co. being used. The pipes are arranged transversely of the car under the seats. Special attention has been given to avoid the pocketing of heated air under the seats, and to insure free circulation in order to maintain an even temperature throughout the car. Ventilation is secured by adjustable sash in the upper deck and by sliding sash in the side-doors. The car is equipped with the Westinghouse quick-action automatic brake.

The total weight of the car, including the wide vestibules, is 84,600 lbs.; the weight of the body being 61,400 lbs., and of the trucks 23,200 lbs.

Master Mechanics' and M. C. B. Committees, 1904.

The subjects and committees for these two associations for the year 1903-1904 have been announced by Mr. J. W. Taylor, The Rookery, Chicago, secretary of both associations. It is possible that some changes in the personnel of some of the committees may be made during the year, but the list gives the arrangement as made by the executive committees.

MASTER MECHANICS' ASSOCIATION.

1. *Ton-Mile Statistics*—To confer with the American Railway Association regarding the mileage allowance for switching engines, and make positive recommendations to the Convention of 1904. C. H. Quereau, Chairman; G. R. Henderson, G. L. Fowler.

2. *Coal Consumption on Locomotives*—To determine to what extent coal consumption is affected by enginemen, size of boilers and grates, loss of time on side tracks, ash pits, terminals, etc. H. T. Herr, Chairman; S. K. Dickerson, R. L. Ettinger.

3. *Locomotive Front-Ends*—To assist in tests being conducted at Purdue University, La Fayette, Indiana, by the *American Engineer and Railroad Journal*, and carry on the tests outlined at the 1903 Convention. H. H. Vaughan, Chairman; F. H. Clark, Robert Quayle, A. W. Gibbs, W. F. M. Goss.

4. *Locomotive Driving and Truck Axles and Locomotive Forgings*—To follow up the proposed specifications as submitted, and make final report after the meeting of the International Railway Congress in 1905. F. H. Clark, Chairman; E. B. Thompson, F. W. Lane.

5. *Boiler Design*—To investigate (a) the proper location of water glasses and gage cocks in relation to the crown sheet and center line of boiler; (b) the proper slope of crown sheet expressed in in. per ft. of length; (c) if the automatic low water detector is a desirable attachment for general use on locomotives; (d) the extent of destruction of side sheets in wide fire-boxes, and the reasons therefor; (e) the best form of radial stay; (f) boiler tubes, with especial reference to length, arrangement and spacing in order to improve circulation and reduce the trouble from leaky flues. D. Van Alstine, Chairman; C. E. Fuller, O. H. Reynolds, H. T. Bentley, Prof. W. F. M. Goss.

6. *Revision of Standards*—To revise the present standards on (a) shrinkage allowances, to provide for the necessary difference between cast-iron and cast steel centers, providing for the larger diameter tires, 70-90 in.; (b) to revise boiler and fire-box steel specifications; (c) to revise specifications and tests for boiler tubes, providing for both steel and iron tubes; (d) to revise specifications and tests for cast-iron wheels for engine trucks and tenders. T. A. Lawes, Chairman; Wm. Forsyth, Wm. Garstang.

7. *Air-Brake and Signal Instructions*—To revise the present air-brake and signal instructions. To confer with committees of the Master Car Builders' Association and the Air-Brake Men's Association. A. J. Cota, Chairman; T. R. Browne, G. W. Wildin.

8. *Piston Valves*—To conduct tests as outlined by report of the committee at the 1903 convention. Wm. McIntosh, Chairman; J. A. Pilcher, H. F. Ball, G. R. Henderson, C. B. Young.

9. *Electrical Equipment of Shops and Shop Power Houses*—To investigate (a) what do the manufacturers need to consider in order to more fully and satisfactorily meet the special requirements of railroads as to electrical machinery; (b) motor driving for shops; what are the essential principles of successful systems; what are the possibilities and limitations of variable speeds in railroad shop practice; (c) what is the most satisfactory system for railroad shops as developed in actual practice? C. A. Seley, Chairman; L. R. Pomeroy, R. V. Wright, R. Atkinson, E. D. Bronner.

10. *Automatic Stokers*—To determine if past experience has led to the belief that they may be satisfactory for general service on locomotives. J. F. Walsh, Chairman; H. T. Herr, J. G. Neuffer.

11. *Locomotive Frames*—To consider (a) the question of large locomotives with reference to a study of the causes of breakage; (b) how shall distortions, both vertical and horizontal, be provided for, and which deflection is most necessary to provide for or prevent; (c) which is the better material, cast steel or wrought iron? S. M. Vauclain, Chairman; J. E. Sague, Reuben Wells, S. Higgins, Alfred Lovell.

12. *Cost of Locomotive Repair Shop*—To determine the cost of the following departments: (a) Power plant. Cost per horse-power, separating boilers, engines, generators, buildings, coal and ash handling facilities, piping, switchboard, etc. (b) Locomotive shops. Cost per cu. ft., and cost of machinery on basis of horse-power of tools and tool list. (c) Countershafting. Relative cost of direct drive as compared with countershafting. (d) Piping, cost of air, water and steam. R. H. Soule, Chairman; L. R. Pomeroy, T. H. Curtis, S. F. Prince, Jr., A. E. Manchester.

13. *Safety Appliances for Locomotive Front-Ends.* J. F. Deems, Chairman; W. S. Morris, J. Milliken.

14. *Subjects.* H. Bartlett, Chairman, J. F. Deems, A. W. Gibbs.

MASTER CAR BUILDERS' ASSOCIATION.

Standard Location of Third Rail for Electrical Operation—A. S Vogt, Chairman; F. M. Whyte, W. P. Appleyard.

Stenciling Cars—H. M. Carson, Chairman; F. W. Brazier, Jos. Buker, W. R. McKeen, Jr.

Coupling Chains—R. P. C. Sanderson, Chairman; R. L. Klein, R. B. Rasbridge, Jas. Macbeth.

Stake Pockets—J. S. Chambers, Chairman; W. E. Fowler, Jas. E. Keegan, R. P. C. Sanderson, M. Dunn.

Best Prevention of Rust on Steel Cars—H. S. Hayward, Chairman; J. S. Lentz, W. G. Gorrell, T. H. Russum. One additional member to be named later.

Outside Dimensions of Box Cars—W. P. Appleyard, Chairman; C. A. Schroyer, Jos. Buker, A. S. Vogt, F. H. Clark, H. F. Ball, J. J. Hennessey.

Cast-Iron Wheels—Wm. Garstang, Chairman; J. J. Hennessey, W. H. Lewis, E. D. Nelson, Alex Kearney, H. J. Small.

Air-Brake Hose—Le Grand Parish, Chairman; T. S. Lloyd, J. Milliken, F. H. Scheffer, H. Swoyer.

Prices for Repairs of Steel Cars—T. H. Russum, Chairman; R. F. McKenna, I. N. Kalbaugh, E. B. Gilbert, Geo. N. Dow.

Tank Cars—A. W. Gibbs, Chairman; C. M. Bloxham, R. Gunn.

Subjects—J. T. Chamberlain, Chairman; J. S. Lentz, C. A. Schroyer.

STANDING COMMITTEES—MASTER CAR BUILDERS' ASSOCIATION.

Arbitration—W. S. Morris, Chairman; P. H. Peck, J. J. Hennessey, T. W. Demarest, E. D. Bronner.

Supervision of Standards and Recommended Practice—W. P. Appleyard, Chairman; T. W. Demarest, T. S. Lloyd.

Triple Valve Tests—A. W. Gibbs, Chairman; W. S. Morris, Wm. McIntosh, C. A. Schroyer, A. J. Cota.

Brake Shoe Tests—Chas. Coller, Chairman; Wm. Garstang, Prof. W. F. M. Goss.

Tests of M. C. B. Couplers—R. N. Durborow, Chairman; W. P. Appleyard, Jos. Buker, W. S. Morris, F. H. Stark.

Draft Gear—E. D. Bronner, Chairman; W. F. Kiesel, Jr., S. F. Prince, Jr., Mord Roberts, T. A. Lawes, Le Grand Parish.

Freight and Express on Electric Railroads.

The following is an extract from a paper by Mr. J. B. McCleary given at the 22d annual convention of the American Street Railway Association. Altogether about 500 letters were sent out but the replies may be taken as representative:

Seventy-one roads out of 182 handle freight and express, 45 roads admit that it is profitable and that they intend to increase their facilities for handling their business, 37 say that this is a very attractive feature of electric railroading, while nine answer that while they carry freight they do not think well of it. Thirty-five roads use the steam railroad classification of their states or railroad districts, others have rate sheets of their own based upon local conditions and generally much lower than the steam railroads. Thirty-eight have depots at terminals and along their lines, and nine say they have none. Twenty-four are silent on this subject. Eighteen handle steam railroad cars on their line, the track is good and the special work will allow it, but this cannot be done in many cities and towns, except on the outskirts and suburbs, near factories and mills. Fifty roads have separate freight cars or trains, three have trailers attached to passenger cars, and eight handle packages on passenger cars. One hundred and eleven answered that they do not handle freight at all. Seventeen of these admit that they believe it should be done, and four of the 111 request information, stating that they are interested in the idea. The following table is a compilation of the answers contained in the 182 letters:

Handle freight and express on electric railways	71
Do not handle freight and express	111
	182
Profitable	45
Doubtful	9
Leased to local express companies	5
Non-committal	10
Non-profitable	2
	71
Attractive	37
Steam railroad classifications	35
Depots	38
Handle steam cars	18
Separate freight trains	50
Trailers	3
Use passenger cars	8

Thirty-three freight carrying roads do not handle steam cars. Six have flat rates. The biggest development seems to be in the middle west. Thirty-seven roads reported the gross earnings from freight and express for 1902 as aggregating over $1,000,000. The amounts vary from $1,000 to $1,000,000 in round numbers, or an average of over $27,000 per road. The operating expenses of the freight department do not seem to be very accurately kept.

Nickel Steel for Purposes of Construction.*

The properties of nickel steel that recommend it as a material for construction are toughness, great tensile strength, a high elastic ratio and an ability to withstand, to a high degree, shock and repeated changes of stress. It is, in addition, of a more uniform structure than ordinary carbon steel, less subject to segregation, and less corrodible. The present limits to the tensile strength of simple steel are the brittleness and want of reliability under shock of the high carbon steels. The addition of nickel increases the strength and ductility of a steel of given carbon content and permits the use of a higher carbon and therefore stronger steel—on account of the greater endurance under shock that nickel imparts to the steel.

This resistance to shock is taken advantage of in the adoption of nickel steel for armor plates, where a single enormous shock must be met. Experiments have been made to test its endurance under vibratory and repeated alternating stresses. One by the U. S. Testing Bureau at Watertown, Mass., comparing nickel steel with wrought iron and steels of varying carbon, in resisting alternations of stress, is given as follows:

Under a fibre stress of 40,000 lbs. per sq. in.

Wrought iron breaks after 59,000 alternations of stress.

0.15 per cent. carbon steel breaks after 170,000 alternations of stress.

0.25 per cent. carbon steel breaks after 229,000 alternations of stress.

0.35 per cent. carbon steel breaks after 317,000 alternations of stress.

0.45 per cent. carbon steel breaks after 976,000 alternations of stress.

3¼ per cent. nickel steel carbon .25-.30 per cent. breaks after 1,850,000 alternations.

4½ per cent. nickel steel carbon .25-.30 per cent. breaks after 2,360,000 alternations.

5½ per cent. nickel steel carbon .25-.30 per cent. breaks after 4,370,000 alternations.

Hadfield quotes a record of experiments on $^{13}/_{16}$ in. diameter nickel steel staybolts under a stress of 1,000 lbs., one end vibrating through an amplitude of ⅛ in. at the rate of 500 vibrations per minute. Three specimens withstood respectively 292,420, 219,920 and 362,220 vibrations before breaking—stated to be three times as much as any staybolt of iron previously tested.

Hitherto the bulk of experiment on rolled nickel steel has been on medium steel of about .20 per cent. to .25 per cent. carbon with a nickel content of about 3 per cent. To test the applicability of a higher carbon nickel steel for structural purposes the Carnegie Steel Company made a heat of the following composition:

Carbon, 0.35 per cent.; phosphorus, .022 per cent.; Manganese, .68 per cent.; sulphur, .022 per cent.; nickel, 3.24 per cent.

This heat was rolled into plates of various gages, angles, rounds and eyebar flats and forged into axles. A number of specimen tensile tests were made of each section and gage, and, the results being uniform, are shown averaged in Table 1.

TABLE NO. 1.—TESTS OF NICKEL STRUCTURAL SHAPES AND PLATES.

Specimen cut from.	Elas. limit, lbs., per sq. in.	Ult. Strength, lbs., per sq. in.	Per cent. elong. in 8 in.	Per cent. redu. of area.	No. of Tests Averaged.
¾ in. rolled rounds	65,780	97,030	18.0	42.4	4
3x3 5/16 in. angles	65,610	98,070	18.7	49.2	1
3x3 7/16 in. angles	86,790	115,470	14.7	23.6	1
3½x3½x⅜ in. angles	70,700	105,950	16.2	37.4	1
3½x3½x½ in. angles	70,220	105,170	18.4	37.2	2
4x4x⅝ in. angles	80,830	108,700	14.1	39.5	2

*Extracts from a paper read at the June meeting of the Engineering Society of Western Pennsylvania by Ralph H. Watson.

4x4x½ in. angles	69,850	100,770	15.5	44.9	2
6x4x⅝ in. angles	67,400	103,550	17.3	39.9	2
6x6x¾ in. angles	62,080	96,150	18.6	34.3	2
6x6x½ in. angles	70,650	103,550	18.9	39.9	2
6x6x7/16 in. angles	68,130	106,000	17.3	39.9	1
6x1½ in. eyebar flats	76,420	95,990	20.4	45.7	3
6x2 in. eyebar flats	73,430	97,550	17.8	40.7	5
⅜ in. Universal mill plates	64,650	97,500	17.3	39.3	2
½ in. Universal mill plates	70,500	113,600	16.6	29.2	2
¾ in. Universal mill plates	63,370	103,550	19.4	44.0	2
Average	70,400	103,000	17.4	39.2	.
Annealed specimens.					
6x1½ in. eyebar flats	56,440	82,150	23.2	59.1	3
6x2 in. eyebar flats	57,470	83,050	23.5	50.3	4
Average (annealed)	56,950	82,600	23.35	51.1	.

Analysis: Carbon, 0.35 per cent.; phosphorus, .022 per cent.; manganese, 0.68 per cent.; sulphur, .022 per cent.; nickel, 3.24 per cent.

The standard specifications for medium structural steel call for a tensile strength of 60,000 to 70,000 lbs. per sq. in., an elastic limit of not less than one-half the ultimate strength and an elongation in 8 in. of 22 per cent. The average elastic limit of the nickel steel, as shown by the above table, is approximately the tensile strength and double the elastic limit of medium structural steel, while the tensile strength has been increased about 50 per cent. and the elongation diminished only 20 per cent. The elongation in a rolled carbon steel of approximately 100,000 lbs. tensile strength has been found to be not more than 12 per cent.

No difficulty was experienced in working these plates and shapes; specimens were sawed, sheared, punched, drilled, planed, turned, threaded and drifted.

The eyebar flats were headed and annealed at Pencoyd and pulled in full size tests. These results, together with results on a heat of lower carbon nickel steel, are given in Table 2.

Specifications for large eyebars for use in long span bridges now being built are:

FULL SIZE TESTS.

Tensile Strength	58,000 lbs. per sq. in.
Elastic Limit	½ Ultimate Strength
Elongation in 20 ft.	Minimum, 10 per cent.
	Average, 12 per cent.

and

Tensile Strength	58,000 lbs. per sq. in.
Elastic Limit	30,000 lbs. per sq. in.
Elongation in 20 ft.	12 per cent.

The elastic limit of the annealed nickel steel eyebars, as shown by the full size tests, exceeds the present specifications by over 50 per cent. Their substitution for carbon steel eyebars would effect a saving—based upon a comparison of their elastic limits—of about one-third the weight of the eyebars. The adoption of nickel steel shapes for the other important members in bridge design would, on account of the relatively higher elastic limit in the unannealed steel, effect a still greater proportion of saving.

The diminished weight of the dead load of the bridge would then be an important factor for consideration; nor would it lose in rigidity or resistance to deformation under a load or shock, for in point of rigidity nickel steel excels simple steel relatively as much as in tension.

The question was raised in the discussion of a paper by Mr. Riley before the Iron and Steel Institute as to whether "engineers and ship builders could, in dealing with composite riveted structures, such as boilers or the hulls of ships, depend upon getting rivets which would be workable and trustworthy and of which the strength would be adequate, in proportion to the high tensile strength of plates of the new material that would have to be combined." Nickel steel rivets since made and tested and to some extent applied in actual construction for boiler making have been found adequate. They are tough and fibrous, of a high shearing and tensile strength, readily worked and not unduly sensitive to careless heat treatment. No difficulty has been experienced in working the steel or obtaining tight joints.

The danger of over heating by the carelessness of forge boys must always be considered in a rivet steel. At the suggestion of the Bureau of Steam Engineering of the United States Navy, experiments were made to determine the effect of over heating on nickel steel. Tensile tests on the steel previously heated to temperatures ranging from dark red to white showed about the same percentage increase in tensile strength and decrease in ductility as met with in simple steel of a similar carbon content. Similar tests were made at Bethlehem on the shearing strength of nickel steel rivets: plates were riveted both double and single shear and for purposes of comparison, similar plates were riveted with simple steel rivets. Out of eight tests on nickel steel rivets in single shear, the plate failed in two and the rivets in six. In double shear, the plate failed in six, the rivets in two. The shearing strength of rivets, based on the tests in which the plate broke as well as on those in which the rivets sheared, was as follows:

Nickel steel rivets, single shear....85,720 lbs. per sq in.
Nickel steel rivets, double shear...90,070 lbs. per sq. in.
Simple steel rivets, single shear....43,600 lbs. per sq. in.
Simple steel rivets, double shear...46,000 lbs. per sq. in.

The temperature of riveting did not perceptibly influence the results. Mr. White, who conducted the experiment, deduces that a ¾ in. nickel steel rivet may safely replace a 1 1/16 in., or even a 1⅛ in. simple steel rivet.

Nickel steel car and locomotive axles are in use with good results. The properties essential to an axle, toughness, rigidity and resistance to fatigue or deterioration under alternating stresses are admirably met by nickel steel. In Table 3 are given two averages of results of drop tests on nickel steel axles. The first is an average of 40 tests from as many open-hearth nickel heats made on axles for the Pittsburg, Bessemer & Lake Erie Road, four thousand of which are now in use. The second is an average of tests on nickel steel axles of a higher carbon content forged from the experimental heat referred to at the beginning of this paper.

The Pennsylvania Railroad specifications for axles require the following tests:

Weight of drop, 1,640 lbs.

Height of drop, 43 ft.

5 in. x 9 in. axles, 5⅜ in. at center—to stand 5 blows with a maximum deflection of 5½ in.

5½ in. x 10 in. axles, 5⅞ in. at center—to stand 7 blows with a maximum deflection of 5½ in.

Nickel steel axles of .26 per cent. carbon have the rigidity of .40 per cent. carbon simple steel axles and excel them in toughness. A remarkable feature is the tenacity with which they hold together after rupture has commenced, requiring, as shown in the table, 25 blows to break after starting to crack. There is an instance of a smooth forged nickel steel axle of about the same composition withstanding 95 blows before starting to break and finally breaking on the one hundred and thirtieth. The endurance of the 5½ in. x 10 in. simple steel axle of about 80,000 lbs. tensile strength, tested to destruction under similar conditions averaged 33 blows, with an average deflection after the first blow of 3.⅝ in. The average deflection in a 5 in. x 9 in. axle of simple steel is about 5.⅞ in. The high tensile nickel steel axle is more rigid than the ordinary carbon steel axle, yet requires a greater number of blows to break.

A careful series of experiments have just been completed at Purdue University to determine the relative friction of a nickel and carbon steel axle, with the following results:

(1) Nickel steel journals are found to require a longer time to wear to fit the brasses than the carbon steel.

(2) After a good fit is established nickel steel offers from 6 to 10 per cent. less friction than carbon steel.

The rigidity, hardness and uniform close grain of nickel steel makes it very well adapted for rails. Nickel steel rails were laid by the Pennsylvania R. R. on the "Horse-shoe" curve where rails experience very severe service and wear out rapidly. Mr. Joseph T. Richards, Engineer of Maintenance of Way, says of this track—"it has worn out now two or three ordinary rails and is only beginning to show the effects of the traffic, that is, the wear is hardly enough to be considered and it should, as far as wear is concerned, outlast at least four ordinary rails. Time alone can tell how much longer it will go."

These rails were made of Bessemer nickel steel of about .50 per cent. carbon, and 3.¼ per cent. nickel. This first experimental lot being found too hard, recent large orders for nickel steel rails have been filled with Bessemer nickel steel of about .45 per cent. carbon, which, with the colder finishing of rails as adopted by our leading rail mills in the last few years, will produce a more elastic rail without sacrifice of the wearing qualities of the harder nickel steel.

TABLE NO. 2.—FULL SIZED TESTS OF NICKEL STEEL EYEBARS.

Analysis.	Nominal size.	Elas. lmt. lbs. per sq. in.	Ult. str. lbs. per sq. in.	Elastic ratio.	Percentage elongation. In 12 in.	In 10 ft.	In 18 ft.	Per cent. reduc. in area.	Anneal'g temp., deg. F.
	6x1 in.	46,300	74,100	62.48	28.75	16.2	....	49.80	1,392
	6x1 in.	43,100	69,000	62.47	31.50	17.7	....	49.60	1,250
Carbon	6x1 in.	45,510	70,420	64.63	31.75	16.2	....	54.80	1,300
0.21 per cent.	6x2 in.	47,300	72,200	65.50	30.20	16.3	....	42.90	1,517
Manganese	6x2 in.	46,260	74,290	62.27	29.60	17.4	....	46.90	1.517
0.53 per cent.	6x2 in.	44,040	68,200	64.58	28.30	15.3	....	53.10	1,256
Nickel	8x1½ in.	43,510	74,720	58.31	31.00	14.5	....	51.46	1,292
3.265 per cent.	8x1½ in.	43,730	73,620	54.40	35.17	17.1	....	49.69	1,292
	10x1¼ in.	44,530	75,410	59.05	36.66	15.1	....	40.00	1,300
	10x1¼ in.	46,320	72,920	63.52	30.33	13.7	....	47.00	1,392
Average		45,060	72,490	61.72	31.33	15.95	....	48.525	....
	6x2 in.	47,820	85,000	56.2	22.59	10.6	9.17	42.47	1,400
Carbon	6x2 in.	46,350	83,780	55.3	29.33	12.8	10.76	52.17	1,400
0.35 per cent.	6x2 in.	48,580	87,190	55.7	27.00	11.5	9.77	38.80	1,400
Manganese	6x2 in.	48,230	86,130	55.9	22.00	11.2	9.50	41.90	1,400
0.68 per cent.	6x2 in.	48,380	86,490	55.9	22.25	10.5	9.50	44.20	1,400
Nickel	6x1½ in.	49,350	86,240	57.2	25.17	12.0	10.44	45.75	1,400
3.20 per cent.	6x1½ in.	49,820	85,490	58.2	24.59	11.3	10.27	44.00	1,400
	6x1½ in.	49,360	86,160	57.3	23.33	9.8	8.44	42.74	1,400
Average		48,490	85,810	56.5	24.53	11.2	9.73	44.00	....

TABLE NO. 3.—DROP TESTS ON NICKEL STEEL AXLES.

Analysis. No. of Tests Averaged.	Carbon, per cent.	Manganese, per cent.	Nickel, per cent.	Elas. limit, lbs., per sq. in.	Ult. Strength, lbs., per sq. in.	Elong. in 2 in., per ct.	Red. in area, per cent.	Diam. of axle at ctr.—in.	Hgt. of drop in ft.	Wgt. of drop in lbs.	Deflec. after 1st blow—in.	No. of blows at wh. axle star'd to break.	No. of blows at which axle broke.	Size and finish of axle.
40	0.26	0.75	3.25	51,130	85,520	28.0	50.6	5⅜	44	1,640	5½	42	67	5x9 in. smooth forged.
8	0.35	0.68	3.24	55,560	97,960	22.5	43.1	5⅞	43	1,640	3⅝	..	49	5½x10 in. tur'd all over.

The Right of Way of Street Railroads.*

It has always seemed to me, when the question of the right of way of street cars has been under discussion, that it has been approached from the wrong point. This defect in the discussion seems to arise from a lack of clear statement of what is meant by "right of way." Street railroads, in the sense that steam railroads enjoy this privilege, have no "right of way." A steam railroad operates along a strip of land, owned in fee, which it holds and uses for its special purposes, and it can only be obstructed by trespassers. The case of a street railroad is different. It has a franchise to go along a rigid and appointed route on thoroughfares which are used in common by pedestrians and vehicles.

The question of "right of way," in so far as it is applicable to street railroads, becomes one not of right of way but of precedence, since the general public has equal rights on the road. These roads or streets being dedicated to public use, it is the duty of the authorities to see that they are so policed as to obtain for the greatest number of people the fullest and freest use of the facilities which they afford. If street railroad men would view the topic from this point of view and insist that the streets are for the use of the people instead of corporations or individuals, the whole question, in a short time, would take on a different aspect. A railroad company is permitted primarily to exist, not for the aggrandizement of its owners or operators, but for the accommodation of the public.

An individual citizen who enters and pays a fare does not thereby relinquish any of his rights to free passage along a public street, and there is hardly an hour of the day or night in which he can enter a car on a street anywhere in a city without finding company, so that the vehicle in which he rides represents not only his individual right, but the assembled rights of all his fellow passengers. A crowded car, full of people, should, by mere preponderance of the number of individuals it contained, have a superior right of passage to a vehicle with a single individual in it, or to a van containing merchandise. If, before public bodies, it was unanimously insisted by railroad men that the reason they demanded "right of way" was because of their passengers, I think it would disarm much of the resistance which has met the attempt to secure police co-operation.

A good analogy between the rights which all street railroad operators claim for their vehicles is to be found in the rules of the road concerning United States mail vans. These have the right of way everywhere, and it is a misdemeanor to obstruct their free movements. The reason of this is not because the wagon is labeled "United States Mail" or because of any superior authority vested in the driver, but because the vehicle contains hundreds—it may be thousands—of business communications involving complicated business interests. For the same reason, I have always held that a street car containing a crowd of people, necessarily in haste or they would find a cheaper and more leisurely way of reaching their destination, had rights superior to other vehicles. These public conveyances are restricted in their movements to a fixed way, whereas the others, in addition to being lighter and more easily moved, have a flexibility of route denied to tramcars.

*Abstract of a paper by Mr. H. H. Vreeland presented to the 22d annual convention of the American Street Railway Association, September, 1903.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 83 Fulton Street, New York.

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CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvements. Discussions of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

If the Interborough Rapid Transit Company's new lines in the Borough of Manhattan, which are described in this issue, were now in operation, the present population would have ample facility for getting about. Its elevated road carries 216 million passengers a year; the Metropolitan surface cars carry over 300 million; and the new subway will carry perhaps 200 million more, besides the Brooklyn tunnel and the independent lines to be operated by the Pennsylvania and the New Jersey street railroads across the North River. Nevertheless, all of these lines which will then be in operation will probably be fully burdened by the beginning of 1905, soon after their completion. The new terminal of the New York Central, with electrically operated suburban lines on the Harlem and Putnam divisions, and on the main line to Croton or Peekskill; the probability of similar suburban service on the New York, New Haven & Hartford and the Port Chester road, and the certainty of a tremendous increase in city travel to come from the Pennsylvania route across New York, from Long Island and from New Jersey, all indicate that previous records of increase in the city's travel will be left far behind. We give an unusual amount of space to the report. Fragmentary accounts of portions of the work have been printed previously in the *Railroad Gazette*, but the opportunity now seems excellent to put on permanent record a condensed history both of the legal and of the engineering features of the rapid transit subway and its connections. It is not much of an exaggeration to say that Manhattan Island is shaped like a lead pencil, with most of the business done at the point, and the thorough and rapid measures which New York has taken to relieve the resulting congestion of its enormous passenger traffic to and from the crowded districts and to harmonize and unify transportation routes between the boroughs, constitute an epoch in the history of rapid transit.

In another column is an account of a superintendent who punished a local freight engineman while he neglected to blame the conductor. We print this because it will help to illustrate a point that we have often tried to emphasize in discussing superintendents' duties, the point that the superintendent is bound to use his utmost endeavors to treat his enginemen, and other employees, kindly, even when cold justice does not require him to go so far. This is an ex parte statement, and we do not, of course, pretend to say whether it is or is not full and fair. That is immaterial to our purpose. But there are innumerable cases which such a statement would exactly fit. The superintendent lacks the true sense of justice, and subjects the engineman to an unfair decision; the aggrieved man has not the courage, energy and discretion to appeal and fight for his rights and so his grievance serves to sour not only his own but his fellow-workers' minds for an indefinite length of time. It is easy enough to deal with an unjust superintendent; he can be dismissed. The more difficult problem is with the superintendent who aims to keep his men contented but who does not succeed; who has not quite enough energy, discernment, tact and patience to carry out his good intentions. In considering cases like this we like to point to superintendents like the one described by a Lackawanna correspondent, in these columns, a few weeks ago; those who will take the time to enlighten their men by means of two-hour interviews. Two hours is a quarter of a day; but the superintendent of 500 or 1,000 men such as conductors and enginemen cannot make better use of many of his quarter-days. He can thus acquire as well as impart knowledge. Many enginemen must be changed from hard runs to easy ones before they are themselves ready to admit that their age has imposed that necessity; and it is no more than a reasonable business amenity for the superintendent to soften the blow as effectively as possible. The directors can relieve him of a part of this burden by retiring employees at 65 or 70 on pensions; but this is at best a rather crude measure, and there is still left ample opportunity for the superintendent to deal with details. It might be well to have a general rule retiring men from fast trains or other hard runs before they are 65; it may be necessary to take five years or more to begin and carry out any systematic scheme of this kind; it may be that the penalty will not be very severe if these necessary and desirable things are not done; but however we decide details, the main question remains. A force of efficient men is a necessity; and an element in efficiency is contentment.

The Barge Canal.

On November third the people of the State of New York will vote on the proposition to build a 1,000-ton barge canal from Lake Erie to the Hudson River, by way of the Mohawk River, Oneida Lake, the Seneca River, and the existing Erie canal, at a cost of $101,000,000. It is proposed to raise this sum by indirect taxation, extending over a period of 50 years, at the end of which time the last of the canal bonds will have been retired.

The arguments of the advocates of a canal have proceeded along several different lines, but, in fundamentals, they are more or less interconnected. They start with the premise that New York City is rapidly losing prestige, owing to her alleged lack of a transportation route from the west as attractive to grain shippers as are the routes to other export ports, such as Newport News. It is also alleged that New York State is neglecting an opportunity to develop industries in the cities and towns along the canal. The barge canal, if built, is expected to carry raw materials at wonderfully low rates to interior cities, and the ensuing growth of these cities is to furnish a market for local farm produce, raised in the adjacent agricultural districts.

The reason that these things are to occur is because rates are going to be lower. The reason that rates are going to be lower is that the troublesome features of fixed charges and taxes, always a hindrance to the development of a transportation route, are to be removed. Rates will be lower, the canal men say, because water transportation is, in the nature of things, cheaper than land transportation. Like many of the creative and attractive arguments which have been presented on behalf of the canal, this is pretty nearly true; the only amendment necessary is that water transportation, without charges for taxes, interest and maintenance, is, in the nature of things, cheaper than rail transportation, with taxes, interest and maintenance. Grain, ore, and bulky articles can be hauled far cheaper on a lake steamer than by rail, but this would not be true if the owners of the steamer were first compelled to make a lake.

We who oppose the building of the barge canal are asked to consider the commercial advantages which would have accrued to New York State if nature had endowed it with a deep waterway from the Great Lakes to the Hudson. But, unfortunately, no such natural deep waterway exists, and in this broad and clear distinction between what might have been and what is, lies the reason why the proposed barge canal, instead of being the cheapest transportation route to the sea, would surely be the most expensive.

The canal committee, a voluntary organization, estimates that on the improved barge canal wheat *can* be carried for a trifle over half a mill per ton mile. The estimate involves many assumptions which surely are guess work. Canal boats at present, for instance, can make about seven round trips each season. The committee assumes that under the new conditions, a steamer and three consorts can make ten round trips. It evidently does not seem probable to these gentlemen that the enormous traffic they predict is likely to cause congestion at the locks or elsewhere. But, for convenience, if it is granted that their estimate is thoroughly conservative, and that they could make good their enthusiastic premise that "canal transportation will be carried on in a business like manner, as nearly as practicable in accordance with modern railroad practice," there still remain the casual items of fixed charges and maintenance.

Fixed charges on $101,000,000, at 3 per cent. (it is possible, however, that a slightly lower rate of interest might be secured) amount to $3,030,000 annually. The annual cost of maintenance cannot be ascertained so exactly, but the advisory board of engineers, made up of such competent men as Alfred Noble and the late George S. Morison, estimate it at from one to 1½ per cent. of the total cost. Taking maintenance at 1¼ per cent. on 101 millions, therefore, the annual charge on this account would be $1,262,500. The canal committee makes no estimate whatever on superintendence and on conducting business, exclusive of maintenance, as the term is used in railroad work. Such expenses were about $350,000 last year, on the present canal, and would certainly be greater on the barge canal, though it is impossible to say how much greater. This, of course, does not include anything corresponding to fuel or trainmen's wages.

For the sinking fund to retire the canal bonds, the committee estimates that about $900,000 will be required annually, for 50 years. To this must be added an annual sinking fund charge for the present canal debt, amounting to about $225,392, and $255,000 interest on the existing debt. Tabulated, these charges appear as follows:

Interest on new bonds	$3,030,000
Sinking fund, new bonds	900,000
Maintenance	1,262,500
Superintendence, etc.—at least	350,000
Interest on old debt	255,000
Sinking fund, old debt	225,392
	$6,022,892

To this annual charge should be added the salaries of engineers in the State Engineer's office, who would correspond to the head of a railroad's engineering department. As there is no way of prorating their services, however, the item is omitted.

If, therefore, every known item is listed at the lowest figure possible, and the unknown items are omitted entirely; if the canal carries each year the maximum tonnage estimated by its friends, without congestion or delay, and there is no excess of expenditure anywhere, it would be theoretically able to carry a bushel of wheat from Buffalo to New York for 7.7 mills, transportation, plus 9.3 mills, fixed charges, or for 17 mills.

Professor Raymond demonstrated in the *Railroad Gazette*, March 9, 1900, that the New York Central could haul freight at a theoretic cost of from .6 to .7 of a mill per ton mile. This comes to about 6.8 mills, as the least railroad cost for hauling a bushel of wheat from Buffalo to New York, as against 17 mills, least canal cost. Both of these estimates are theoretic, but the estimate of railroad cost is made from definitely known premises, whereas the only definite item in the canal scale is that of fixed charges already in existence.

But, as to the cost of transportation, there is no more reason to suppose that a boatman is going to scale his charges to the point where his head is theoretically just out of water, than there is in the case of the railroad. Also, as to fixed charges, every underestimate, every "extraordinary expenditure," and every bit of political manipulation of the tempting funds, means a permanent increase. As to the chance that the canal could be built for $101,000,000, the late George S. Morison said he believed it could be, if it were properly handled, "with a competent set of engineers and a competent staff of inspectors, with a perfectly fair letting, and everything handled in the best way in which the best management handles it." In view of all previous experiences New York has had with large State contracts, Mr. Morison's statement seems sufficiently qualified to

need no further comment, unless it be that, in politics at least, hindsight is better than foresight. For the present, popular attention would be sharply fixed on the disposition of the canal funds, but with passing years and changing administrations—who can tell?

In any case, the canal advocates put the State in the curious position of taxing the railroads, its largest commercial enterprises, for the support of a competitor. Reduce the barge canal proposition to its lowest terms, and it becomes an order on the Buffalo-New York railroads to pay the fixed charges of an alternate, parallel transportation route, in the expectation that the rates of the railroad may thereby be reduced. The rights of the individual producer are jealously guarded by the prohibition of foreign contract labor and of convict labor; has the corporate producer no rights, as well? The difference between the aggregate boatmen's charges and the total yearly cost of transportation on the barge canal represents nothing more than a subsidy, paid to one corporate citizen for the express purpose of enabling him to damage the business of another.

The Fire Dangers of Electric Railroads.

Mr. Westinghouse's letter on some of the dangers attending the working of heavy electric railroads is definite and circumstantial, and is not to be improved by comment. But it suggests a few words that may be interesting to some of our readers who are not familiar with the methods and motives of the writer of the letter, or who may not remember very clearly the storm which he aroused by a similar letter some twenty months ago.

At that time Mr. Westinghouse was denounced as an enemy to the progress of the art of electric traction, and selfish and mercenary motives were attributed to him. At the time we said "he was exactly right, as will gradually be made clear." The demonstration has come, with a great sacrifice of life; but even twenty months ago there had been sufficient warning, for an electric train had been burned in Liverpool, killing seven people, and there were records of the burning of hundreds of individual electric cars, many of them burned to the trucks. It did not take great imagination or power of reasoning to foretell what would have happened if these cars had been in trains in dark tunnels, where they could not have been quickly reached with fire hose. But a few weeks ago an engineer who lives in London told us that he had forbidden the members of his family to travel by the tube railways—not that he is a timid man, but that he is a wise man and accustomed to dealing with the forces of nature.

Inevitably this new letter will bring out the same sort of criticism that followed the first one, but probably there will be less of it, for the Paris fire was a very convincing fact. In view of that criticism it is not uninteresting to speculate, discreetly we hope, on the motives which inspired this letter.

The author is a man of extraordinary foresight and courage. His mental habit is to take long looks into the future, and when he sees the end clearly nothing scares him—superficial or prejudiced criticism least of anything. So it is easy to understand how he is willing to frighten investors in electric railroads and travelers by electric railroads, even if he loses money by doing it, for the ultimate greater good of the art in which he is so deeply interested. It takes moral courage, as well as foresight, to do this, and to deliberately face misunderstanding and wilful misrepresentation.

It will at once be said by some and be thought by many that this letter was written to advance the use of the system of electric train control recently brought out, for there are a good many cynics in the world which we inhabit. What if it were? The facts are facts just the same. The dangers pointed out can hardly be exaggerated, and the precautions suggested are good, sound engineering.

At this moment the Pennsylvania is building steel cars at Altoona for its New York City tunnel, and the Interborough Company has from the outset designed its cars to reduce the fire risk as far as that can be reduced in a car not entirely of metal.

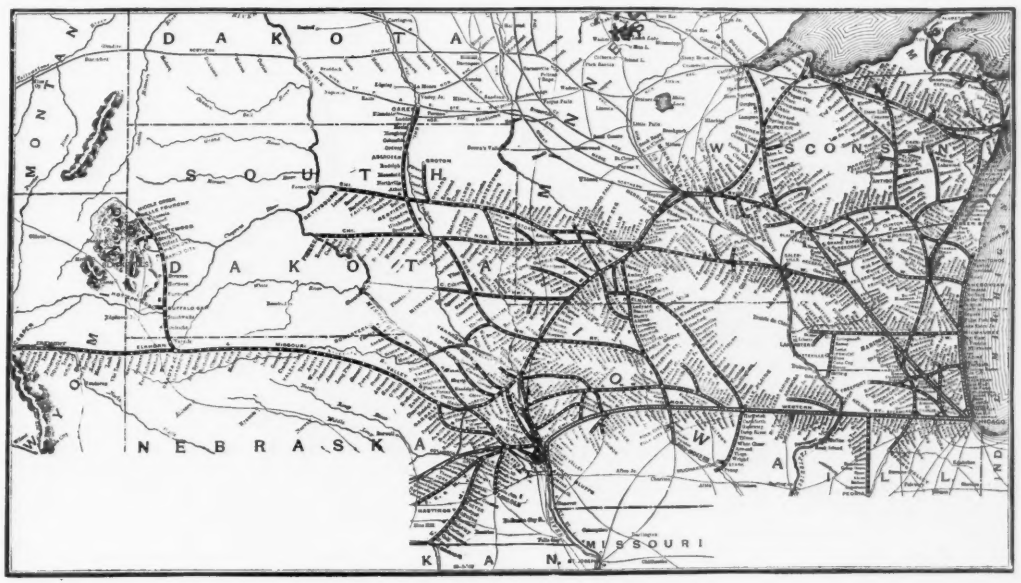
The use of a 14-volt battery current in the control line instead of the motor current is a characteristic of the Westinghouse control, and is obviously an advantage so far as fire risks go. The sectional third rail, energized only under the train, is more debatable. Apart from the greater cost, it introduces complications which many electrical engineers think prohibitive; but we are quite willing to take Mr. Westinghouse's word that it is only a matter of expense. Every man of affairs knows that one of the most powerful obstacles to progress is contentment with things as they are and reluctance to attack new troubles; and when an authority so competent tells us that the sectional third rail is mechanically practicable, we are sceptical as to the knowledge or pluck of those who say that it is not.

Finally, it must not be thought that Mr. Westinghouse has any monopoly of the improvements and precautions which he urges. The Westinghouse Electric Company and the General Electric have a working agreement for the use of each other's patents and in advancing the art. Mr. Westinghouse is also helping his most powerful rival.

Chicago & North Western.

The report for the year ending May 31, 1903, shows continued gains in gross earnings from all sources. Freight earnings were $35,171,064, an increase of $1,734,172, and passenger earnings were $12,036,277, an increase of $1,150,138. Earnings from express, mail and miscellaneous also increased by $314,349 to a total of $2,635,440. The total gross earnings, therefore, were $49,842,781 as against $46,644,121 last year. The average number of miles operated, however, was increased during the year from 5,760 to 6,332, so that gross earnings per mile of line were slightly less than in 1902, amounting to $7,871 as against $8,097. In addition to the increase in main line mileage the company had in operation May 31, 1903, 797 miles of second main track and 2,383 miles of sidings and yard tracks, showing no increase over the year previous in second track but an increase of 263 miles in sidings, etc.

In common with most of the railroads in the country, operating expenses increased considerably during the year and with taxes amounted to $33,260,113, or 63.1 per cent. of gross earnings as against $30,005,642, or 61.3 per cent. last year. This increase in operating expenses, due to increased wages, increased maintenance of way and equipment and higher general expenses and also to



Chicago & North Western.

the increased mileage, caused a reduction of net earnings from $16,638,479 in 1902 to $16,582,668. The balance brought forward to net income, however, after payment of operating expenses, taxes and fixed charges and augmented by income from investments was well over $10,000,000, indicating that the road is in an exceedingly healthy condition. Out of net income, $5,013,418 was appropriated for construction, improvements and permanent additions to the property, as against $4,697,055 last year, and dividends were paid amounting to $4,852,014. During the year $7,452,000 of bonds were retired by the issue of 3½ per cent. general mortgage gold bonds of 1987, effecting an annual saving in interest of $258,800. The annual saving on the whole amount of bonds refunded to May 31, 1903, with general mortgage gold bonds of 1987 amounts to $602,375.

The total charge for maintenance of way and structures during the past year was $6,247,400 as against $6,138,171 last year. This is at the rate of $986 a mile. Included in the expenditure is the cost of 56,890 tons of rails, the greater portion of which were laid in replacement of rails of lighter weight in 461 miles of track and also the cost of laying 1,592,444 new ties. The maintenance of way expenditures for the year also included a large portion of the cost of ballasting 30 miles of track with crushed stone, 316 miles with gravel and 78 miles with cinders and slag. Also the erection in place of wooden structures of 116 steel bridges on masonry and 16 on pile supports, aggregating 5,314 ft. in length, and the replacement of other wooden structures with masonry arch box culverts and cast iron pipes, the openings being filled with earth. The wooden structures replaced by permanent work during the year, exclusive of those replaced in connection with the building of second main tracks, aggregated 11,842 ft. For maintenance of equipment the charge was $5,031,795, an increase of $298,268 over the year previous. Ten new switch locomotives, costing $100,338, were purchased to replace others. Last year 42 locomotives were charged to the same account, less the amount received from the sale of the old rolling stock which they replaced, so it will be seen that the motive power is being well kept up without capital cost. During the last fiscal year 1,378 freight cars and 16 passenger cars were also acquired to replace others, and in the year previous 1,376 freight cars were purchased or built by the company and charged to maintenance, and seven passenger cars.

Dividing out ton-miles by train-miles, it is of interest that the average train load decreased from 249 tons, in 1902, to 231 tons. In view of the fact that the average cost per mile run by locomotives increased 1.17 cents, owing to higher fuel and wages, and that train load was less, the excellent showing made in freight earnings is surprising, and was due to a marked gain in rates. Average ton-mile earnings amounted to 8.7 mills, as against 8.4 mills in 1902, 8.5 mills in 1901, and 8.3 mills in 1900.

NEW PUBLICATIONS.

American Railway Engineering and Maintenance of Way Association.—The volume of the Proceedings of the fourth annual convention of this association has just been published and contains the complete reports and discussions presented at the meeting last March. These have appeared more or less fully in the *Railroad Gazette*. The volume contains 549 pages, including an index. The appendix gives a list of the members, and the number of miles of road represented by each, also the Constitution and General Rules of the association and the personnel of the committees. An interesting and well written memorial of Augustus Torrey, late Chief Engineer of the Michigan Central, summarizes his life and work and constitutes an important feature of the volume.

How to Measure Up Woodwork for Buildings. By Owen B. Maginnis. New York: Industrial Publication Company, 1903. Price 50 cents.

This little book of 79 pages gives full and explicit directions for doing the work indicated by its title both in actual houses and from plans. The information which it contains is based on a long experience and should be of much aid to the estimator or mechanic. It is illustrated with 160 figures showing characteristic interior and exterior finishes for windows, doors, wainscoting, balusters and rough timbering for frame houses and contains besides, many valuable tables of commercial sizes and weights of timber.

Proceedings of The International Railway Master Boiler Makers' Association. Edited by W. J. Ritchie, Secretary. Published by the association, 1903.

This pamphlet of 160 pages contains the official proceedings of the second annual convention of the association, held at Columbus, Ohio, May 19 to 21, 1903. This is one of the newest of the railroad mechanical societies but a casual examination of the reports and discussions at its convention will show that it is doing good work in its own field and that its members are keenly alive to the problems and possibilities of boiler making. The proceedings in part were published in the *Railroad Gazette* May 29, 1903.

TRADE CATALOGUES.

Henschel & Sohn, Cassel, Germany, have published a handsome souvenir catalogue to mark the completion of the six thousandth locomotive turned out from their shops. It is printed in German, French and English, in parallel columns, and is illustrated with half-tone engravings of a number of recent designs of engines for all classes of railroad and industrial service. A general description accompanies each illustration. There is besides, a brief history of the works since they were founded in 1817. The first locomotive was turned out in 1848. This concern is the largest builder of locomotives in Europe, having now a capacity of 400 a year. It also does a large engineering business in boilers, steam engines and heavy machine tools.

Mr. C. A. Mosso, Dryden, N. Y., is sending out letters setting forth the merits of Monarch tempering compound.

It is claimed that a thin chipping chisel tempered with this compound can be driven through a ¾ in. bar of iron with a 20-lb. sledge without bending, breaking or upsetting the tool. A drill can be hardened to cut chilled cast iron or Mushet steel without chipping the edge of the drill or breaking it. Tempering can be done at a lower temperature than is possible with water and hence "water checks" are prevented. The compound has been in use for 22 years.

Graphite.—The September number of this periodical, published in the interest of Dixon's graphite productions, contains a reproduction of a circular printed about 1848, advertising Dixon's black lead crucibles and giving testimonials from several European firms. In this 1848 circular attention is called to the fact that the melting pots had then been in the market 30 years.

Westinghouse Electric & Manufacturing Co., Pittsburg, has issued three circulars, Nos. 1,044, 1,048, 1,068, dated August, 1903. Circular 1,044 describes the type of direct-connected railroad generators made by the company, No. 1,048 describes the Westinghouse 68 and 68c railroad motors, and No. 1,068, type S, direct current motors for general use.

Pneumatic Signal Co., Rochester, N. Y., has sent out bulletin No. 4 on facing point switch protection in which are given diagrams showing a number of methods of indicating by a mechanically operated distant signal, the position of the switch point. The Anderson-Bevan derail and one type of dwarf interlocking machine are also described.

The Wabash Extension to Baltimore.

The recent plans of the Wabash Railroad as announced by President Joseph Ramsey, Jr., are quite in accord with the aggressive policy shown by the Gould system during the past few years. The Gould system, now one of the largest in the country, has its center in the Missouri Pacific Railroad Company, incorporated in 1876 as the successor of the Pacific Railroad Company of Missouri, and now includes 17,000 miles of road. It extends from Detroit through Chicago and St. Louis to Denver and Ogden in the far west, El Paso in the southwest, and New Orleans on the Gulf of Mexico. It has been the aim of Mr. Gould, for several years, to extend the system to the Atlantic coast. Efforts to reach New York proving futile he bought from the city of Baltimore the control of the Western Maryland, and shortly afterwards obtained control of the West Virginia Central & Pittsburg. The city of Pittsburg was the next point of attack, and, in the fall of 1902, after a sharp struggle with Pennsylvania interests, an entrance into that city was secured. With terminals in both Pittsburg and Baltimore, the next step was to build the links, both east and west of Pittsburg, necessary to connect the Wabash with Baltimore. Under the name of the Pittsburg, Carnegie & Western, a line is now being built west of Pittsburg through Carnegie and Patterson's Mills to Jewett, Ohio, a point on the Wheeling & Lake Erie, owned in the Gould interest. This will be the connecting link between all of the western lines of the Gould system and Pittsburg. To make this a through line to tide water in the east an extension from Patterson's Mills south via Waynesburg to a connection with the West Virginia Central & Pittsburg at Montrose is projected. Bids for the first section of this line are now being asked, and officers of the company say that work will be begun at once.

The most important link in the Wabash line from Pittsburg to Baltimore, however, is from a point a few miles south of Cumberland, Md., to Cherry Run, W. Va. A 60-mile survey has been made which follows the Potomac River, crossing the Chesapeake & Ohio Canal seven times, the Potomac River nine times, and the Baltimore & Ohio tracks three times. The most difficult features of this extension are five tunnels, the longest being 4,300 ft. The work will be quite heavy, with a maximum grade of about 1 per cent., and a maximum curvature of 6 deg., and the estimated cost per mile is placed between $50,000 and $70,000. This extension unites the West Virginia Central & Pittsburg and the Western Maryland, and according to Mr. Ramsey, is to be completed by August, 1904. The Degnon-McLean Contracting Company of New York has the contract for the first 22 miles west of Cherry Run, and the second and third sections have been let to McArthur Bros. of Chicago, and to Kilpatrick Bros. & Collins of Chicago, respectively. Work has been started by all three firms. The construction of these two new railroads, forming a through Wabash line from Baltimore to Pittsburg, will not, however, mean the establishment of what is usually understood by a "trunk line to tidewater." The Western Maryland, with its present heavy grades and light rails, is wholly inadequate to handle the through freight from Pittsburg to tidewater which will be developed, and a large work is to be done in regrading and rebuilding that road and in building docks and elevators for a suitable terminal at Baltimore. The accompanying map, Fig. 1, shows the proposed and existing lines of the Wabash and the Baltimore & Ohio between Pittsburg and Baltimore; and Fig. 2 shows on a larger scale the projected route of the line from Cumberland to Cherry Run.

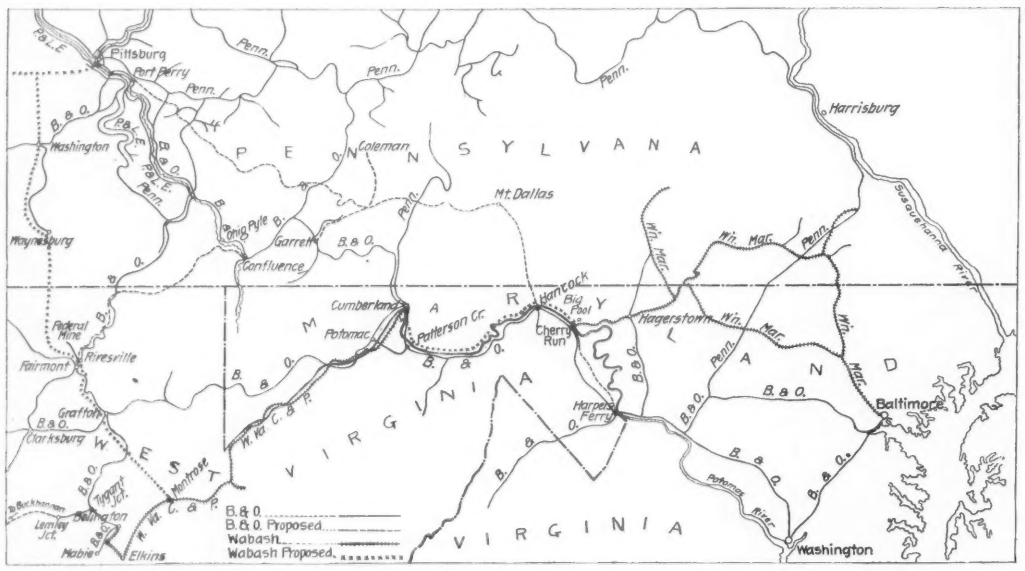


Fig. 1.—Proposed and Existing Railroads Between Pittsburg and Baltimore.

Heavy Mallet-Type Locomotive for the B. & O.

Last week we noted (page 607) that the Baltimore & Ohio had under advisement the building of a heavy compound locomotive of the Mallet articulated type for use on heavy grades; the intention being to have this locomotive do the work of two and dispense with a pusher. The order for the locomotive has been placed with the American Locomotive Company. An idea of its general appearance may be had from the accompanying illustration.

The Mallet compound is of the four-cylinder type. Usually all of its wheels are drivers, which are arranged in two groups. The rear group is carried by the main frame and is driven by the high-pressure cylinders. The forward group is carried by a supplemental frame and is driven by the low-pressure cylinders. The frame and wheels of the low-pressure engine form a truck on which the forward part of the locomotive is supported. The arrangement gives a locomotive of long total wheel-base but short rigid wheel-base. The total weight is available for adhesion. It is especially adapted to slow, heavy work on grades where sharp curves must be passed. The Walschaert valve gear is used.

The building of this locomotive by the B. & O. is an experiment. Should it demonstrate its usefulness in the service for which it is designed, others will doubtless be built. The boiler will carry the unusual pressure of 235 lbs.

The following dimensions, furnished by the B. & O., compare the Mallet type with the I-7 class, which are the heaviest locomotives used on the road in regular freight service.

General Dimensions.

	Articulated.	I-7
Gage	4 ft. 8½ in.	4 ft. 8½ in.
Fuel	Bituminous coal.	Bituminous coal.
Weight in working order	285,000 lbs.	193,500 lbs.
Weight on drivers	285,000 lbs.	173,000 lbs.
Weight engine and tender in working order	415,000 lbs.	325,000 lbs.
Wheel base, driving	30 ft. 6 in.	16 ft. 6½ in.
Wheel base, rigid	10 ft. 0 in.	16 ft. 6½ in.
Wheel base, total	30 ft. 6 in.	24 ft. 9 in.
Wheel base, total, engine and tender	61 ft. 5 in.	57 ft. 7½ in.
Width of frame	5 in.	4 in.
Center to center		44 in.

Cylinders.

Diameter of low-pressure cylinder	32 in.	
Diameter of high-pressure cylinder	20 in.	22 in.
Stroke of piston	32 in.	28 in.

Valves.

Kind of valves	Balanced.	Balanced.
Type of gear	Walschaert.	Link.

Wheels.

Number of driving wheels	12	8
Diameter of driving wheels outside of tires	56 in.	56 in.
Material of driving wheel centers	Cast steel.	Cast steel.
Thickness of tire	3 in.	3 in.
Driving box material	Cast steel.	Cast steel.
Diameter and length of driving journals	9 in. x 13 in.	9 in. x 13 in.

Boiler.

Style	Wagon top.	Belpaire wide fire-box.
Working pressure	235 lbs.	205 lbs.
Inside diameter of first ring	76 in.	69½ in.
Horizontal seams	Sextuple riveted. Butt seam.	Double welt. Butt seam.
Circumferential seams	Double riveted.	Double riveted lap.
Fire-box length	105 in.	104⅞ in.
Fire-box width	77 in.	66 in.
Fire-box water space, front	5 in.	5 in. bot. 7 in. top.
Fire-box water space, sides	5 in.	5 in. bot. 6½ in. top.

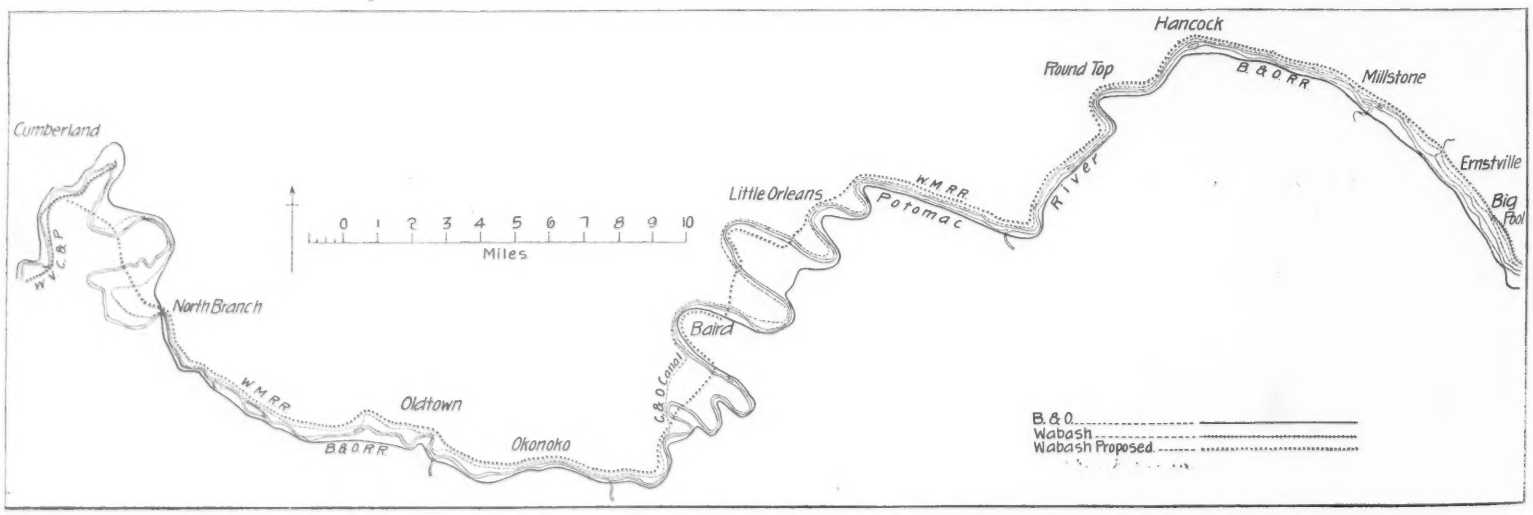
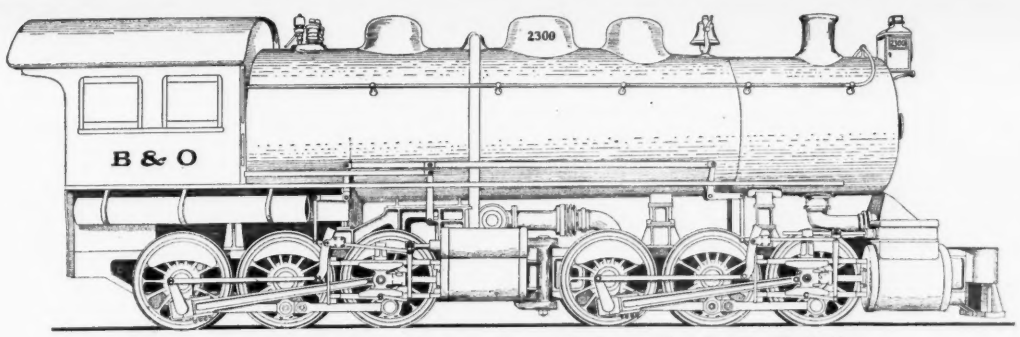


Fig. 2.—Line of Proposed Railroad to Connect the West Virginia Central & Pittsburg with the Western Maryland.



Mallet Articulated Type Tandem-Compound Locomotive for the B. & O.

Fire-box water space, back....	5 in.	4 in. bot. 7 in. top.
Fire-box crown staying.....	Radial.	
Fire-box staybolts	Flexible and screw.	Flexible.
Tubes, number	376	369
Tubes, diameter	2¼ in.	2 in.
Tubes, length over tube sheets.	18 ft. 9 in.	13 ft. 9½ in.
Tubes, heating surface.....	4,135	2,662.92
Fire-box, heating surface.....	190	184.32
Total heating surface.....	4,325	2,847.24
Grate surface	56.1	48.06
Height of stack above rail....	15 ft.	15 ft.
Ratios.		
Heating surface to grate surface	77.1	59.24
Heating surface to cylinder volume	.0068	.00216
Tractive power	63,800	39,688
Heating surface to tractive power	15.43	13.98
Tractive power to weight on drivers	4.46	4.31
Tender.		
Tender frame	Channel.	Steel.
Water capacity	7,000 gals.	7,000 gals.
Coal capacity	13 tons.	13 tons.

Third Rail Dangers.

Mr. George Westinghouse makes another valuable addition to public knowledge of the dangers to be avoided in the electrical operation of elevated and tunnel trains in a letter to the New York *Times*. With the recent Paris underground electric railway accident as his text, he says:

The lessons to be drawn from this accident are important, and I believe they will lead to the adoption of apparatus and methods which ought to make an electrically propelled train as safe as one drawn by a steam locomotive, and thus insure a realization of the great advantages of electrically driven trains.

The supreme importance of the subject prompts me to again urge such a revision in the heretofore accepted plans as will insure safety to passengers and employees, as well as the avoidance of ultimate great losses to companies operating electric railways.

It will be recalled that, following the collision between steam-propelled trains in New York City in the Fourth Avenue tunnel on the New York Central Railroad in January, 1902, involving great loss of life due to escaping steam, there was an exciting discussion of the event, with a widespread expression of a belief that had such trains been operated by electricity there would have been no loss of life; and for days almost the entire press of New York devoted columns to the subject and urged prompt legislation which would compel the New York Central Railroad Company to use electricity instead of steam for the operation of its trains within the city tunnels.

Having had a long experience in matters pertaining to the safe working of railroad trains and having acquired a very considerable knowledge of the power and peculiarities of electricity, I believed I might do a public service by drawing attention through the press to the elementary fact that the electric operation of trains could not lessen some of the risks, but might, on the contrary, add new ones of a serious character, and I therefore wrote a letter which you published in your columns at the time, and which has recently been extensively republished.

That letter was criticized favorably by some, but was belittled and denounced by interested parties as calculated to impede the introduction of electricity for traction purposes.

Since then as a result of that discussion, there have undoubtedly been great improvements demanded and made in the character of electrical apparatus for railroad use; but as often happens, it has required an awful experience to bring home to those charged with the responsibility of guarding against railroad accidents the fact that there is no margin for use in tunnels of combustible material in proximity to a heavily charged electric conductor.

The recent injury to a number of workmen engaged upon the elevated railroad is only another illustration of the need for a revision of the plans which have heretofore prevailed and which have evidently been regarded by many railroad officials as reasonably safe.

The realization of the great cost of such an accident as the recent one in Paris, regardless of the horror of it, will undoubtedly cause the plans already decided upon to be most carefully reviewed, and should bring to the officials of the companies interested the highest skill in determining the requirements, the compliance with which will render the carrying of passengers on trains operated by electricity as safe at least as if propelled by other means.

It seems almost axiomatic that the third rail should only be charged with electricity when required to operate a train; that there should never be more electric energy at any point of a third rail than sufficient to operate one train; that the electric machinery required upon a train should be reduced to a minimum, and should be so located as to be under the convenient supervision of the train attendants; and in all tunnel and elevated railroad work there should be no material to create fire or dense smoke.

The following requirements, among others, can easily be complied with, and are respectfully suggested for consideration and discussion:

1. Trains to be constructed of iron or steel, with the interior finish of incombustible materials.

2. The division of the third rail for the supply of electric current into suitable sections, each section being supplied with current only when required to propel a train.

3. The limitation, by suitable devices, of the amount of current supplied to each section so that in the event of a short circuit on the train the current will be automatically and instantaneously cut off at a point some distance from such section of the third rail.

4. Provision for the cutting off of the current from each supply section of the third rail at the will of the motorman.

5. No other live conductors than the third rail to be in close proximity to the line.

6. No wires carrying high voltages except upon motor cars, and motor cars only at the ends of a train.

The state of the electric art has so advanced that compliance with the foregoing requirements is simply a matter of additional expense, incomparable, however, to the financial losses which the companies will suffer if they do not make the electric operation of their railroads absolutely safe.

Believing the foregoing requirements can be complied with, I have read with amazement the opinions quoted in your Friday's issue under the heading: "No device to stop third-rail killing." I am sure Mr. Hedley must have been misquoted in regard to the possibility of collisions due to the temporary shutting off of the current from the third rail, for, as a matter of fact, the stopping of the trains on the elevated railroad is not in the slightest degree affected by the temporary cessation of the current on the third rail.

It is true, however, that the system of train control in use upon the elevated road, and which has been ordered for the rapid transit trains, is so organized that its correct operation is dependent upon a constant supply of current to the third rail, and that therefore the division of the third rail into sections and the temporary supply of current only as needed, might, with the existing system of train control, be inoperative, but there are available well-tried train controls which are operative regardless of a temporary interruption in the supply of current.

It is well and sorrowfully recognized by our great railroad engineers that early mistakes, due to inexperience, in the dimensions adopted for tunnels, gage of track, and in the method of coupling cars have established practices which cannot now be escaped from because of the necessity for a uniform practice, in the points cited, on connecting railroads.

The advantages to accrue from this necessity for uniformity in railroad practice to that concern which can secure the adoption of its plans covered by patents has led to a commercial rivalry the influence of which for evil cannot well be appreciated. This intense rivalry between the two great electric manufacturing companies of the country, each enjoying the same rights under numerous patents has undoubtedly led to a great improvement in the electric art, but to that rivalry, where none should exist, can also be attributed much of the cause for the present alarm concerning the unsatisfactory method of electric operation of trains.

If, therefore, a frequently adopted practice be adhered to, viz., that having already expended a large sum for electric plant and equipment of a certain character, there must hereafter be used for extensions and upon connecting lines only such apparatus and methods as will fit in with the existing plans, however imperfect they may be, then there is small hope for a safe system of electric traction.

The most recent accident on the Paris underground railroad, where passengers were frightened and jumped from the train, illustrates how necessary it is to so install electric apparatus that there can be no such alarming occurrences.

Being sure of my ground and of the necessity for public pressure in securing the desired reforms, I believe fully that electric traction can be made safe.

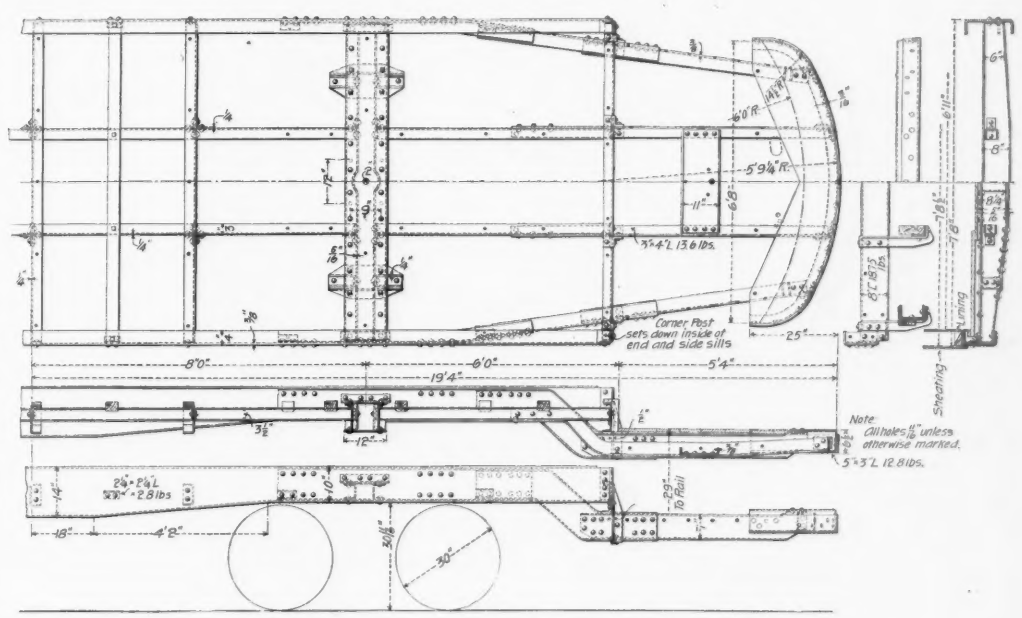
GEORGE WESTINGHOUSE.

Pressed Steel Underframe for Street Car.

The Pressed Steel Car Co., Pittsburg, has designed the steel underframe for street cars shown in the accompanying engraving and is now building them for equipment recently ordered by a number of street railroads. This use of an entire steel underframe, including the platform and buffer beam, is an innovation in this class of car building. Rolled steel shapes have been used for body and platform sills in heavy interurban and steam road cars but nearly always in combination with wooden filling blocks and auxiliary members of the framing. The design here shown is intended for a 28-ft., double-truck street car and is made entirely of steel, pressed and rolled shapes.

The two side sills which carry all of the load between the bolsters are pressed steel, fish-bellied channels of ⅜-in. plate, 10 in. deep at the bolsters and 14 in. deep in the center with a flange 4 in. wide. The bolster is built up of two pressed channels of 5/16-in. plate, tied together with ⅜-in. top and bottom cover plates, 12 in. wide. The channels are drawn down at the ends from 7½ in. to 4½ in. where they rest on the bottom flange of the side sills. The cross-ties between bolsters are pressed channels of ¼ in. plate and these support longitudinal stiffeners on which the floor nailing strips rest. These stiffeners are light channels 3½ in. deep, of ¼ in. plate and are not intended as essential members of the underframe. The end sill is an 8 in. rolled channel and is set 5 in. below the top of the side sills.

The platform sills are 7 in. pressed channels and 3 in. x 4 in., 13.6 lb. angles, the latter being the center members. Because of the lower level of the platform, the two outside platform sills are spliced to a bent channel riveted to the body side sills and dropping down under the end sill. The angle center sills are riveted to the light body center sills back of the end sill and are bent down to pass under it. All four of the sills are supported on stirrups hung from the end sill and are secured to the bumper beam by angle plates. The bumper beam is a 5 in. x 3 in. angle, 12.8 lbs., bent to the proper curvature.



Steel Underframe for Street Car—Pressed Steel Car Co.

The Master Blacksmiths' Convention.

The eleventh annual convention of the National Railroad Master Blacksmiths' Association was held in Buffalo, N. Y., on August 18, 19 and 20. In the absence of President John McNally, who was detained by illness, the meeting was presided over by Vice-President Lindsay. The report of the Secretary and Treasurer showed a membership of 300, and a balance in the treasury of $394.92. The officers for the ensuing year are: President, George Lindsay, Evansville, Ind.; First Vice-President, T. F. Keane, Hillburn, N. Y.; Second Vice-President, J. Reily, Buffalo, N. Y.; Secretary and Treasurer, A. L. Woodworth, Lima, Ohio (re-elected); Chemist, G. H. Williams, Boston, Mass. (re-elected). Indianapolis was chosen as the next place of meeting.

Reports of committees and individual papers were in part as follows:

REPAIRS OF STEEL AND IRON FRAMES.

The quality of the material used has a great deal to do with the success in repairs. None but good scrap bar iron should be used, and it should be double-worked. If the slab is over-heated, do not use it. I believe a number of the fractures we find in the main bodies of our new frames are often caused by insufficient working of the material.

On the Pittsburg Division of the Pennsylvania Lines in the last two years they have repaired a number of steel frames and have experienced no trouble in doing so. They break in the main section, also in the front section. In the main section they break in the top and bottom members at the back hole; this necessitates putting on a half jaw by increasing the top and bottom member from 4½ in. to 8 in. They have repaired 190 of these frames, both iron and steel. In repairing they use the V weld with the fibers lengthwise of the iron; this style of weld made with a good clean heat cannot be excelled. Blow holes or sand holes are often found, and in one particular frame a cavity large enough to put a hen's egg in was found.

The question of repairing frames on the engine is one that should be given consideration. The cost of removing, repairing and replacing is considerable, and if this method of repairing frames is successful we should give it a fair trial.

The report is signed by John S. Sullivan, Chairman.

Mr. Treacy said he considered the V weld the poorest that can be made, his reason being that this weld receives no side pressure from the blow above. The method of working is not direct enough to make a good weld. He advocated the male-and-female weld.

In response to a question about the use of electricity for welding on the engine, Mr. Laisure said that it was regarded as impractical, as it requires 600 h.p. to weld a sectional area of 16 sq. in.

BEST METHOD OF PREPARING SCRAP TO MAKE IRON FOR NEW AND REPAIRED FRAMES AND RODS.

An important factor is placing the scraps so that each piece shall lap, and, if practical, also placing the fiber of the pieces in the same direction that the forging is to be elongated, as good fibrous iron is what is desired. In no case should steel of any kind be permitted to be placed in the pile, for the reason that steel will not stand such a high heat as is required to weld the iron into a solid mass. In other words, the steel will disintegrate when brought to the heat that is required to thoroughly weld the iron. The fuel used to bring the metal to the proper heat for manipulating is an important factor. Oftentimes the coal used contains a large per cent. of sulphur. Such coal should not be used for any purpose where welding heats are required, particularly scrap piles in a furnace. In the Southern Pacific shops crude oil has been recently introduced for the purpose of producing finished products from scrap material, and is far superior to coal, as well as more economical. The heats come out of the furnace much cleaner than with coal.

If the heating is done too quickly, the outside of the metal becomes hot before the center of the pile, consequently when the metal is worked under the hammer the center of the pile is not thoroughly welded. The proper manipulation under the hammer is also an important factor. The pile should first be squared up with light blows, then drawn carefully to the dimensions required.

This report is signed by S. Uren, Chairman.

A motion that the convention recommend the use of steel for rods, straps, crank-pins and piston rods was adopted.

OIL FUEL FOR MAKING IRON AXLES, AND HEATING SCRAP.

Iron produced with oil fuel has a much cleaner fiber and is more pliable after forging than iron produced from coal-burning furnaces. The increase of material heated in the oil furnace as against the coal furnace should recommend it.

One particular defect in iron axles forged from coal fuel is the seams that are found. This is not to be found in axles forged with oil fuel. I am now forging all our supply of 30-ton and 40-ton axles from scrap iron, and also heating for all our bolts and forging machines, as well as the bulldozer, with oil fuel.

A forging produced from oil fuel will show a slight degree more oxidation than that forged from a coal or gas furnace, and that is the objective point of many who condemn the oil as fuel and advance the argument that the metal is burned and overheated. Metal that is overheated will not oxidize, as there is no oxygen or hydrogen in the metal after it has been subjected to such treatment, and without those two elements there will not be any oxidation of the material.

This report is signed by T. A. McNeal.

CASE-HARDENING.

The best material to be case-hardened for guides, links, link-lifters, blocks and saddles, eccentric-rod jaws and all motion work is No. 1 fibrous hammered iron. We do not think it advisable to use granular iron for any purpose where case-hardening is required. To do so would greatly depreciate its reliability, owing to the shortness of its initial structure. Nor would we recommend merchant bar iron with its rawness, lack of density, and too great percentage of slag.

Guides made of good hammered iron should remain in the carbon after becoming red hot, from 20 to 24 hours. A carbon penetration of $^3/_{16}$ in., or even ¼ in., is none too deep for them. Lighter articles such as links and all motion work will have the proper penetration of carbon ($^3/_{32}$ in.) after being held at the right temperature for from 15 to 16 hours. The proper temperature for case-hardening runs from 1,550 to 1,700 deg. F.

There have been misleading statements made as to the effect case-hardening has on the tensile strength of iron, some claiming it loses 10 per cent., others saying 33⅓ per cent. A test piece I have brought with me having an area of ½ sq. in. was subjected to red heat for five hours, and shows a carbon penetration of $^1/_{32}$ in., giving 82 per cent. of area not hardened and 18 per cent. hardened. The tensile strength of this piece was 55,330 lbs. per sq. in. The tensile strength of the same iron not hardened was 54,420 lbs. per sq. in., which gives a percentage of 1⅝ in. favor of the hardened iron. Another piece with 1 sq. in. area was subjected to red heat for 10 hours and shows a carbon penetration of $^1/_{16}$ in., giving 76.5 per cent. not hardened and 23.5 per cent. hardened. The tensile strength of this piece was 46,325 lbs. The same iron not hardened had a tensile strength of 44,000 lbs., leaving 5 per cent. in favor of hardened iron.

A test of two other pieces was identical with test No. 2 as far as time subject to red heat, penetration, area of hardened and unhardened parts are concerned, but they were quenched immediately in cold water. The average tensile strength of these two pieces was 54,185 lbs. per sq. in. Two similar pieces not hardened had a tensile strength of 48,900 lbs., leaving $9^{85}/_{100}$ per cent. in tensile strength in favor of hardened iron. This also shows about 4¾ per cent. in favor of quenching at the first heat.

Two pieces were subjected to red heat for 15 hours, giving a carbon penetration of $^3/_{32}$ in., 66 per cent. of area not hardened and 34 per cent. hardened. Average tensile strength 53,405 lbs. Average strength of similar pieces not hardened was 48,900 lbs., leaving 8½ per cent. in favor of hardened iron.

The above four tests seem conclusive that case-hardened iron will show a greater tensile strength than raw iron. Case-hardening iron stiffens it and adds to its torsional, shearing and bending strength equally as much as to its tensile strength.

Three test pieces of common merchant bar iron were all heated together for 12 hours for the purpose of testing the virtue of annealed case-hardened iron. One was quenched when taken from the furnace. A second was allowed to cool in the atmosphere, reheated and quenched. The third was quenched when taken from the fire, reheated and annealed in dry ashes, heated again and quenched, showing no depreciation in penetration or degree of hardness, but the hardened part has been refined very perceptibly. This would indicate that iron case-hardened to a considerable depth, and having passed through service that necessitated its re-machining, could be annealed, and after being trued up could be reheated to a low red and quenched, thus avoiding the necessity of adding more carbon. At the same time this would lessen the danger of the iron springing or winding, which we frequently have to contend with in case-hardening, as it requires a higher degree of temperature to qualify iron for absorbing carbon than it does to harden it in water after the carbon is absorbed.

This report is signed by A. W. McCaslin.

There were also reports on "Tool Steel," "Oil Furnaces" and "Car and Locomotive Springs," and a paper by Mr. T. F. Keane on piece-work, in which he dwelt on its advantages for smith shops. The convention adopted a motion that the Association favors piece-work wherever practicable.

TECHNICAL.

Manufacturing and Business.

The Chicago Pneumatic Tool Co. has received a contract to supply the Chilean Navy with tools of all kinds for the building and repairing of ships.

The Phoenix Railway Supply Company, of Jersey City, has been incorporated in New Jersey, by H. O. Coughlan, Joseph N. Mitchell and Beverly B. Lewis.

The Automatic Railroad Gate Company, Erie, Pa., has been incorporated in Delaware, with a capital of $150,000, by J. N. Hinkle, John Craig and others.

A report from Sydney, N. S. W., says that bids are soon to be asked by the Government for 100 locomotives, to be built in Australia during the next four years.

The Niagara Safety Trolley Guard Company, Niagara Falls, N. Y., has been incorporated in New York, with a capital of $50,000. The directors are Edward McDonnell and others.

Offices have been opened in the City of Mexico by D. G. Farragut, at No. 8 Calle de Gante. Mr. Farragut is the representative in Mexico of the Pressed Steel Car Company of America.

The shops of the T. H. Buckley Car Manufacturing Company, Worcester, Mass., to make cars of all description, are to finished in about two months. Thomas H. Buckley is President and Treasurer.

Press reports state that the general offices of the Colorado Fuel & Iron Company will be removed to Pueblo, Colo., and that the Burnham shops will also be removed to that place. A number of new buildings will have to be built in connection with this removal.

Clarence B. Vorce, Member American Society of Civil Engineers, who, for the past six years, has had an office as Civil and Consulting Engineer at 80 Pearl street, Hartford, Conn., has been made Chief Civil Engineer of The John F. Kelly Engineering Company, 149 Broadway, New York City.

The Memphis Bridge Company, of Memphis, Tenn., has been incorporated with a capital of $50,000, to make railroad and highway bridges. The incorporators are Robert L. Owens, Geo. L. Austin and C. O. Horton, and W. M. Hewitt, of Chattanooga, who is President of the Chattanooga Bridge Company.

Contracts have been awarded by the Lehigh Valley for new shops at Sayre as follows: Grading, John F. Dolan, Elizabeth, N. J.; structural steel, American Bridge Company; buildings, F. D. Hyde, 7 East 42nd street, New York; concrete piers, ducts and pits, S. B. Mutchler & Son, Phillipsburg, N. J.; drainage, Herman Riebe, Lansford, Pa.

The Interborough Railroad Company has contracted for an escalator to be installed at the 33d street station of the Sixth Avenue Elevated Road, New York, to carry passengers direct to the down town station. A foot bridge will extend over the tracks to the uptown station, and it is anticipated that a majority of the northbound passengers will avail themselves of the escalator and foot-bridge, instead of climbing the stairway used at present.

Sealed bids will be received by H. Fernstrom, Chief Engineer, New York Central & Hudson River Railroad, New York, 3 p.m., Sept. 8, 1903, for the dredging work which may be required by the railroad company for the year ending Sept. 1, 1904, in the waters of the Harlem, East and Hudson Rivers south of the northerly side of Spuyten Duyvil Creek and south of the northerly side of the West Shore Terminal property at Weehawken, N. J.

The Duff Mfg. Co., Allegheny, Pa., sends the accompanying illustration of a novel "cup lifter" which was presented August 19 to Sir Thomas Lipton. This "cup lifter" is a miniature lifting jack, in the form of a small working model, of the Barrett lifting jack, in silver, with a cup on the top of the lifting bar. The jack itself stood 5 in. high. Sir Thomas is reported as expressing satisfaction that he had at last found a successful cup lifter.

The Apex Equipment Co., 11 Broadway, New York, has received an order from the Ballston Terminal Ry. for standard gage hopper cars of special design and for several two-way dump cars, and from the Conneaut & Erie Traction Co. for special flat cars. The Apex company is building 20 steel flat cars, equipped with the John W. King patent steel underframe, for export to the Philippines, to be used in harbor improvement work by the U. S. Government.

Iron and Steel.

The Westmoreland Steel Company of Pittsburg is to put a modern annealing furnace in its works in Greensburg, Pa.

The Eleanor Iron & Steel Co., Irwin, Pa., is receiving bids for the building of an open hearth plant at Butler, with a capacity of about 50 tons.

The Ohio Valley Steel Foundry Co., Paden City, W. Va., has given a contract for the machine tool equipment of its works to the Niles Tool Works Co.

The Detroit Iron & Steel Co., Detroit, Mich., expects to have its new furnace ready next month. The stack is 78 by 18 ft. The company will make foundry, basic and malleable pig iron.

The Carpenter Steel Works of Reading, Pa., expect to employ 800 more hands when the three new mills are finished. To provide for this enlargement an issue of $1,500,000 of bonds will be made. The open-hearth and bloom mills will be built along the river front. The wire mill will be a four-story building.

The Campania de Altos Hornos Mexicanos, organized this year with a capital of $700,000, which has recently been increased to $1,500,000, is operating a blast furnace with a capacity of 200 tons a day in Tepeyahualco. The company owns extensive iron ore deposits. A second blast furnace and Bessemer steel plant will be built. The officers are: Angel Zabalza, President; Emilio Velasco, Vice-President; Emilio Segura, General Manager.

The Standard Steel Car Company, Butler, Pa., is making improvements which will give a capacity of about 100 steel cars a day. An extension is being built to the main building 240 ft. x 500 ft. The capital stock has been increased from $3,000,000 to $5,000,000, and an issue of $2,000,000 bonds has been authorized by the stockholders. Orders have been taken which will keep the company busy until next year, and a few also have been taken for 1904 delivery.

The Continental Mill of the National Tube Company (United States Steel Corporation) at Pittsburg has stopped work, for the first time in 10 years, because the annual wage scale has not been signed. For its Lorain and McKeesport plants now building large quantities of steel have been ordered from the parent company, and a contract has been awarded to the United Engineering & Foundry Co., for building the roll tables at both these places; a contract has also been given to the Mesta Machine Co., for the new 32 in. slabbing mill and two reversing engines for the latter place.

Vehicle Speeds on London Streets.

Mr. Campbell Swinton recently made some observations of vehicle speeds on the streets of London. Over short distances, in some cases, the speed of omnibuses reaches 11 miles; light wagons, 11½ miles; private carriages, 12½ miles; hansom cabs, 12¾ miles, and bicycles, 16½ miles an hour, all this on one of the busiest streets and in the middle of the day. The motor mail wagons of the post office often travel down Victoria street at a speed of more than 20 miles an hour.

Strength of Creosoted Timber.

Mr. William Hood, Chief Engineer, Southern Pacific, has made an extensive series of tests on full-sized sticks of Red Fir to determine the effect of creosoting on the strength of the timber. In the case of 8 in. x 10 in. creosoted beams, the modulus of elasticity, the elastic limit and the modulus of rupture are 0.973, 0.826, and 0.606, respectively, on the basis of unity as the value for untreated timber. The reduced strength is mainly to be accounted for by the presence of checks arising from the creosoting process and from the diminution of the shearing strength of the wood.

M. C. B. Association Letter Ballot.

The secretary of the M. C. B. Association has sent out a letter ballot voting sheet and an accompanying explanatory circular, submitting the changes in the recommended practice and standards of the Association which were proposed at the June convention this year, to the members for their approval. The most important questions to be voted on are the adoption as standards, of a proposed form of center plate, and a new form of contour for automatic couplers. The changes and additions to the recommended practice are important, covering steam and air line connections, signal lamp brackets, high-speed foundation brake gear for passenger cars, specifications for M. C. B. couplers and tank cars. The rules for loading lumber and long material have also been considerably changed and revised and are to be voted on. The votes will be counted in the secretary's office, September 20, and all replies must be sent in before that date.

Production of Steel Rails.

An interesting study of the growth in the production of steel rails in the United States from 1869, together with the price by years and the rate of protection afforded the industry by the Government, is shown by the following table:

Year.	Tons.	Price, per ton.	Duty on foreign rails, per ton.
1869	8,616	$132.25	45 per cent. adv.
1870	30,357	106.75	45 per cent. adv.
1880	852,196	67.50	$28.00
1883	1,284,067	48.50	28.00
1885	959,471	28.50	17.00
1890	1,867,887	31.75	13.44
1894	1,016,013	24.00	7.84
1897	1,644,520	18.75	7.84
1898	1,976,702	17.64	7.84
1899	2,270,585	28.12	7.84
1900	2,383,654	32.29	7.84
1901	2,870,816	27.33	7.84
1902	2,876,293	28.00	7.84

The highest price paid for rails was $132.25 per ton in 1869, while the lowest was $17.64 per ton, paid in 1898, when the steel trade was at its low period of depression. The boom in railroad building in 1900 ran the price up to $32.29 per ton, but since that time the price has been practically uniform.—*Statistics of the American Iron and Steel Association.*

A Mosely Educational Commission.

With a patriotic generosity as rare as it is commendable Mr. Alfred Mosely, the originator of the recent industrial commission on American trade methods, has made arrangements for despatch of a similar commission, composed of educational experts, to investigate and report upon American educational resources and methods. A list of the eminent persons who have accepted Mr. Mosely's invitation, which has been published, makes it certain that the report when issued will be of great value to all interested in the subject of education, and especially its bearing on industrial progress. An itinerary of the commission, drawn up with the assistance of President Butler, of Columbia University, New York, embraces most of the leading educational centers in the United States. In New York itself visits will be paid to the Columbia University, to typical high schools, elementary schools, and manual training classes, the "ethical culture" schools, and the Normal (Training) College. Thence to New Haven, Conn., to visit Yale University and typical manufacturing establishments. Next comes Boston, with visits to Harvard University, the Massachusetts Institute of Technology, and various typical schools. Then Philadelphia, where there is much of educational interest —the University of Pennsylvania, with the school of higher commercial education, the Drexel Institute, Girls' Normal schools, etc.; and Baltimore, with the comparatively recent, but widely known, Johns Hopkins University. From Baltimore the commission will proceed to Washington; thence to Pittsburg, the seat of the great steel industry associated with Mr. Carnegie; and on to Chicago, some of whose educational institutions are almost as famous as its stock yards, grain elevators, and other appliances of commercial wealth. Detroit, Niagara Falls, Ithaca (for Cornell University), Schenectady, and Albany are also on the programme, with possibly for some of the party an extension to California. It is not, we understand, contemplated that the whole of this varied programme will be undertaken by the commission *en masse*. The work will be to some extent subdivided, and so organized that its different members shall see, and afterwards report upon, aspects of educational work in which they are specially interested or on which they are specially qualified to form an opinion.—*The Mechanical Engineer* (London).

THE SCRAP HEAP.

Notes.

A fire in Chicago on the night of Aug. 26 destroyed the large Rock Island freight house; loss about $100,000.

The Chicago & North Western Railroad will retire from service all freight cars with a capacity of less than 30,000 lbs.

Train Wreck in Italy.

A press despatch from Rome states that on the night of August 27 a train carrying troops to the manoeuvres at Urdine, collided at Beano with a freight train, causing a disastrous wreck. A captain and 15 soldiers and one or two others were killed, and 80 persons were injured.

Record for Unloading Ore.

The work done by 10 King machines, equipped with clam-shell buckets, with auxiliary hold scrapers operated by electric motors, is said to have broken the record for unloading ore by taking 5,700 tons out of the steamer "Thomas Adams" in 8 hours and 50 minutes at the Hanna docks, Lorain, Ohio.

Spanish Railroads in 1902.

R. M. Bartleman, U. S. Consul at Cadiz, reports to the Government that during 1902, 144 miles of new steam railroad were opened to traffic in Spain and that the railroads of the Kingdom carried 37,431,038 passengers during the year, an increase of 4,044,510 over the returns for 1901. Freight carried amounted to 19,629,268 tons, which is 831,200 tons more than was carried the previous year. Gross receipts amounted to $54,779,063 as against $51,275,754 in 1901.

A Record Wheat Crop in Kansas.

A recent crop bulletin issued by the Kansas Board of Agriculture and devoted especially to wheat and corn says that the total winter wheat area this year is 5,911,081 acres; and reports from threshers, millers, growers and others indicate that the yield for the entire area sown will average over 15 bushels per acre, making a total for the State of 90,270,000 bushels. This, however, is a preliminary estimate. The year's total production is greater by 66 per cent., or 35,946,200 bu., than that of 1902 and surpasses the previous record yield of 90,045,514 bu. in 1901. During the last three years Kansas has raised an aggregate of 257,000,000 bu. of winter wheat. The ground is in good condition and its quality runs from medium to extra good, the whole crop being merchantable for milling. Late rains temporarily interrupted threshing but have put the ground in the best of condition for fall farming.

American Locomotive Company.

The annual report of the American Locomotive Company for the fiscal year ended June 30, shows an expenditure of $1,627,301 for additions to the company's property. Gross earnings were $33,105,724, increase $6,707,331, equal to 25.4 per cent.; expenses $28,052,314, increase of $4,761,098, equal to 20.4 per cent. Net earnings were $5,053,409; deducting interest and bills payable, leaves a profit of $4,805,253, an increase of $1,803,941 over last year. This has been accomplished without increasing the capital account. The income has been derived chiefly from the sale of new locomotives, extra parts and repairing. This result, with the orders already placed for locomotives, the delivery for some of which is eight months in the future, promises highly satisfactory returns on the investment. Seven per cent. was paid on preferred stock.

A Railroad From a Political Point of View.

A Canadian correspondent writes:

The Grand Trunk Pacific Railway is to run from some point or on near the Atlantic seaboard of Canada to a point at or near an optional point on the Pacific coast.

It may run through unexplored regions of the far north, or it may run some hundred miles further south.

It may be three thousand miles in length, or four thousand, or possibly extensions will bring it up to five thousand miles.

It may cost one hundred million dollars, or half as much more, or possibly double that sum.

It may open out three hundred million acres of cultivable land, or perhaps 30 millions, or peradventure three millions.

It may earn 10 per cent. upon its cost, or it may not pay working expenses.

It may help the Government through the coming elections, or it may not.

The one thing certain about this railroad is that it is to be "made in Canada."

Electrification of Steam Railroads in Germany.

Frank H. Mason, U. S. Consul General at Berlin, reports to the Government that regular traffic has been begun on an experimental electrified portion of one of the suburban railroads from Berlin, starting at the Potsdam station and extending to Gross Lichterfelde, 5½ miles. The current is supplied from the southwestern power station of the existing Ringbahn in Berlin and is transmitted over an insulated third rail laid beside the track. Trains are made up of one second-class and two third-class cars, each 63 ft. long. The total weight of a train is 128 tons and each train can seat 200 passengers. The second-class car is in the center and carries no motor. Each third-class car carries a motor at one end. The cars are new and equipped with heating apparatus and, according to the Consul, would be considered comfortable and up to date in the United States. The opening of the line is noteworthy because it marks the beginning of a general change from steam to electricity for the important and rapidly growing suburban service of Berlin. A second line leading to Köpenick is now being laid with third rail and is to be opened up shortly.

Instructions for Installing Signals.

Mr. Hansel, Vice-President of the Pneumatic Signal Company, New York and Rochester, has prepared a useful little hand book for the guidance of the foremen employed by his company in their field work. It is a pocket book of 50 pages containing 19 pages of printed matter, with a large space for notes after each paragraph. The instructions appear to have been very carefully prepared, the opening pages being a list of things which must be furnished to a foreman before he starts out. He must have complete plans, permits to break ground (where necessary) and a statement of the material to be furnished by the railroad company, as well as all the other things usually required. Where the work is complicated there must be a complete list of compensators and bell cranks, showing where they are to be used. The foreman, on arriving at his destination, must at once compare his plan with the actual arrangement on the ground and also see if his list of material is sufficient for all requirements. He must especially look out for odd sizes of rails and at once test his rail clips and links to see if they fit. Where the railroad company does not promptly perform its part of the work the foreman must keep his company constantly informed.

Scalpers Still Active.

General Passenger Agent George W. Boyd, of the Pennsylvania Railroad, has issued to agents and conductors a circular concerning ticket frauds, which says:

The alteration, by scalpers and other unscrupulous persons, of tickets issued over our lines is becoming so frequent that further protective measures have become necessary, both for the interests of the traveling public and this company. Some of the changes made in tickets for the purpose of defrauding our lines are as follows:

First—Erasure of names of the original purchasers and the substitution of others.

Second—Erasure of the destination originally written in tickets and substitution of another.

Third—Erasure of original dates (when same have been written in contracts) and the substitution of others.

Fourth—Cutting out parts of contracts and substituting new dates for those originally canceled therefrom.

Fifth—Pasting in tickets, that have once been used, the portions cut therefrom by conductor's punches, with intention of securing transportation a second time.

Sixth—Insertion of a "B C" punch through the year stamped on back of summer excursion tickets. These tickets being valid only until Oct. 31 of the year stamped on back, the use of "B C" punch in this manner stated renders it impossible to determine the year of sale and facilitates their use in an unlawful manner.

Seventh—Rubbing off or soiling the date of tickets good for certain number of days from the date of sale, so as to make it impossible to determine same and render their improper use easy.

On the Pennsylvania Lines West of Pittsburg an order has been issued to agents directing them to always require passengers, in signing tickets, to use the pen and ink provided by the company.

The American Bar Association's Anti-Trust Report.

At the annual session of the American Bar Association, at Hot Springs, Va., Aug. 27, a report was read from the Committee on Commercial Law, which attacked severely existing combinations of capital and took the ground that if combinations continued, competition would cease and commercial jurisprudence would eventually be entirely changed. The committee had reached the unanimous conclusion that modern industrial combinations should be stayed. Portions of the report are printed below.

"Combination as an economic force is fast coming to take the place of competition. The producers are combining, transportation companies are combining, trades-

men are combining, workmen as well as employers are combining, everything seems to be combining in some form of combination, and everybody seems to be a combiner. The competition that still remains is fast disappearing. Workmen are refusing to compete for jobs. Labor unions are enlarging the spheres of their activity, and extending their operations.

"A monopoly is economically desirable; that is, for the monopolist. The United States Steel Corporation can produce—no matter what it sells them for—its goods cheaper than the elements out of which the combination is composed ever produced them. The Standard Oil Company is economically holy, for it pays 40 per cent. dividends. The railroad combinations are economically impregnable, for they pay.

"If Mr. Morgan's shipping trust and Mr. Schwab's shipbuilding trust are failures they are exceptions to the rule. We cannot, therefore, rely on natural forces, to limit the growth of modern combinations. If the people of the American nation would be better off without them or with limitations put upon them, they must put those limitations on by the action of their Legislatures, their Congress, and their courts. The American Bar must act, and the American Bar Association must take the lead."

The report proposed the following remedies:

"First—We can tax them to death; or, if that is too radical a remedy, we can tax them until their growth and enlargement is impeded. There is a franchise tax imposed by most of the States upon corporations at the time of their incorporation and annually thereafter. This franchise tax is in almost all States in some way graded so as to tax the small corporation at a higher rate than the large one. The first million dollars pays a higher rate than subsequent millions. In our judgment the gradation should be continued, but it should be a grading up instead of down. We would leave, perhaps, the first hundred thousand free and the first million cheap, and raise the rate with each succeeding million.

"Second—We can compel them to render better and cheaper service. . . . Congress can enact that any corporation or individual that engages in interstate commerce must furnish its services or supply its goods at lower rates wherever, by any combination, competition is prevented than where competition is left free.

"Third—If necessary, the State itself can enter the industrial field as a producer and restore the force of competition to its former supremacy by becoming itself a competitor to the great trusts."

The report is signed by all the members of the committee, consisting of Walter S. Logan, Henry Budd, Gardiner Lathrop, George Whitelock and John Morris, Jr. It received considerable opposition.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

American Association of General Passenger and Ticket Agents.

The next annual meeting of this Association will be held at New Orleans, La., Tuesday, Oct. 13.

Central Railway Club.

At the meeting of this club, which is to be held at the Hotel Iroquois, Buffalo, on Friday, September 11, the principal discussion will be on the rules of interchange. A committee consisting of T. J. O'Donnell, T. Sills and W. H. Rosevear, Jr., has made a report on the changes which were made in the interchange rules at the Saratoga Convention, giving notes on the reasons why the changes were made. The other principal subject for discussion is the amended Federal Safety Appliance Law. The meeting is to be held in the forenoon, beginning at 10 o'clock, and in the afternoon there will be a visit to the Lackawanna Steel Company's plant.

PERSONAL.

—Mr. John Carlisle, a prominent capitalist of Cincinnati, and at one time Vice-President of the Cincinnati, Hamilton & Dayton, died in Cincinnati August 31, at the age of 67. He was interested in the construction of the Ohio & Mississippi and was formerly a trustee of the Cincinnati Southern.

—Mr. Hiram L. Tracy, General Sales Agent of the Taylor Iron & Steel Company, died suddenly in his office in New York city on August 30. Mr. Tracy was about 63 years old and had been for many years with the Allen Paper Car Wheel Company and its successor, the Steel Tired Wheel Company. He went to the Taylor Iron & Steel Company about five years ago.

—Mr. Henry Marquette Lane, formerly principal of the School of Mechanical Engineering of the International Correspondence Schools, Scranton, Pa., has become a member of the staff of *The Railroad Herald* of Atlanta, Ga. Mr. Lane is a graduate of Purdue University and has had considerable experience as a consulting and constructing engineer and an instructor. He becomes mechanical editor of the *Herald*.

—Mr. W. H. Conry, who for the past 20 years has been in the shops of the Atchison, Topeka & Santa Fe at Topeka and recently in charge of the tool room at that place, has been appointed Superintendent of the Engineering Laboratory at Purdue University, La Fayette, Ind. Mr. Conry succeeds Mr. M. D. Strout, who has served in the capacity of Superintendent of the Engineering Laboratory of the University for the past 12 years.

—Mr. G. L. R. French, who has succeeded W. F. Ray as Assistant Superintendent on the Boston & Maine, was graduated from the civil engineering department of the Massachusetts Institute of Technology in 1884. He then went west and entered the service of the Chicago, Burlington & Quincy as a rodman. In 1889 he returned east and entered the service of the Boston & Maine as Assistant Engineer at St. Johnsbury, Vt. After a year there he was transferred to Northampton as Roadmaster of the west end of the Central Massachusetts road, his territory later being extended to include the whole of that line to Boston. He was transferred to Salem in 1895 and appointed Roadmaster.

—Mr. G. F. Bristol, the new General Manager and Chief Engineer of the Duluth, Virginia & Rainy Lake, is a native of Michigan and was born in 1869. He was educated at the Michigan Agricultural College and the University of Michigan. His first railroad service was in 1889, when he entered the service of the Chicago & West Michigan as rear chainman, and continued in the service of this company and its successor, the Pere Marquette, until July, 1903, with the exception of about three months in 1891, when he was engaged on a topographical survey, and from October, 1891, to May, 1892, when he was at college.

—Mr. F. G. Pettibone, who has been appointed General Superintendent of the Gulf, Colorado & Santa Fe, was born at Rockford, Ill., in 1861. In 1875 he entered railroad service as a messenger boy on the Chicago, Burlington & Quincy, and from that date up to 1884 was employed successively as messenger boy, operator, clerk and chief clerk in the Superintendent's office at Burlington, Iowa. In 1885 he was appointed chief clerk to the Assistant General Superintendent of the Great Northern, and in 1886, became chief clerk to the General Superintendent of the Northern Pacific. In 1901 he became Assistant to the General Manager of the Gulf, Colorado & Santa Fe, from which position he has been promoted to be General Superintendent.

—Mr. L. R. Clausen, who has been appointed Signal Engineer of the Chicago, Milwaukee & St. Paul road, succeeding Mr. Elliott, is a native of Wisconsin and was born in 1877. He was educated at the University of Wisconsin, graduating as an electrical engineer in 1897. For two years he worked as an apprentice in several electrical manufacturing establishments. For a year and a half he was electric light tender on the "Pioneer Limited" express trains of the St. Paul road and electrician in charge of electric works of the Chicago terminals of the same company. For ten months he was occupied installing the power plant of the Sunset Telephone & Telegraph Company of Portland, Oregon, and then left the works to enter the Signal Department of the St. Paul as Supervisor in charge of automatic signal work, which position he occupied until appointed Signal Engineer on September first.

—Mr. W. H. Elliott, who has been appointed Engineer of Signals of the New York Central & Hudson River, is a native of Georgia, and was born in 1863. He graduated from the University of the South at Sewanee, Tenn., in 1883, and entered the service of the Central of Georgia as a fireman. At the end of six months he entered the shops of the Savannah, Florida & Western as a machinist apprentice and served three years, about eight months of this time having been spent in the drawing office. For three years he was employed in the test department of the New York, Lake Erie & Western, and then went to the Chicago, Milwaukee & St. Paul as assistant in the office of the Mechanical Engineer. In 1893 he was appointed Signal Engineer of the Chicago, Milwaukee & St. Paul, and has held this position from then until now, when he resigned to go to the New York Central. Mr. Elliott is one of the most prominent signal engineers in the country. The period of 10 years since he began his service with the Milwaukee has been a period of expansion and progress in the art of signaling, and Mr. Elliott has been one of the leaders in this progress. His writings, both for the *Railroad Gazette* and for the Railway Signaling Club, (which have been reprinted in these columns) are well known to the reader. He is one of the most active and influential members of the Railway Signaling Club and is the author of the well known "Block and Interlocking Signals," published in 1896. He may reasonably be expected to do well in his new position, an exacting one both for a scientific signal engineer and an administrative officer, for there is much to be done.

—Mr. Robert C. Blackall, for many years in the service of the Delaware & Hudson and one of the best type of old time motive power superintendents, died suddenly on Monday of this week at his home in Albany, N. Y. He was born at Albany in 1831 and had been in railroad service for about 53 years, having started as a journeyman machinist on the Saratoga & Washington at Saratoga in 1850. In 1853 he was made machinist and gang foreman on the Hudson River road and in 1860 was appointed Master Mechanic on the Albany Northern. From 1863 to 1870 he held a similar position on the Albany & Susquehanna and in the latter year (1870) was appointed Superintendent of Rolling Stock and Superintendent of Motive Power and Machinery of the Delaware & Hudson Canal Company. He remained in this position for 29 years. He was also from 1888 to 1899 Superintendent of Motive Power and Machinery of the Adirondack Railroad. About four years ago Mr. Blackall was retired by the management of the Delaware & Hudson Canal Company, with the title of Consulting Mechanical Superintendent. He was a Past President of the American Railway Master Mechanics' Association and was successively from 1892 to 1894 Second Vice-President, from 1894 to 1895 First Vice-President, and from 1895 to 1896 President. He was also for many years an important member of the executive committee of the Master Car Builders' Association. Mr. Blackall was a man of charming personality and his genial disposition and rugged character won for him a host of friends in the railroad and the business worlds.

ELECTIONS AND APPOINTMENTS.

Ann Arbor.—G. R. Burt, Purchasing Agent, with headquarters at Toledo, Ohio, has resigned and the duties of that office will be assumed by Superintendent W. F. Bradley.

Atchison, Topeka & Santa Fe.—An official circular issued by this company reads as follows: "The resignation of Mr. George R. Henderson, Superintendent of Motive Power, having become effective on July 31, 1903, notice is hereby given that the business of the motive power department will hereafter be supervised by Mr. Alfred Lovell, Assistant Superintendent of Motive Power, with headquarters at Topeka, Kansas." This notice was incorrectly stated in our issue of August 28.

Cane Belt.—The headquarters of R. G. Alexander, Resident Engineer, have been removed from Lane City, Texas, to Eagle Lake.

Blue Ridge Despatch.—R. H. Vaughan has been appointed General Manager.

Chicago, Indiana & Eastern.—H. E. Drew has been elected President and General Manager, with headquarters at Matthews, Ind., and C. A. Knight, Vice-President, with office at Chicago.

Chicago, Milwaukee & St. Paul.—L. R. Clausen has been appointed Signal Engineer, with headquarters at Milwaukee, Wis., succeeding W. H. Elliott, resigned. (See New York Central & Hudson River.)

Chicago, Rock Island & Pacific.—G. W. Vanderslice, Superintendent of the Superior Division of the Northern Pacific at Duluth, Minn., has resigned to become Division Superintendent of the Chicago, Rock Island & Pacific, at Kansas City.

Denver, Northwestern & Pacific.—At a recent meeting of the directors of this company, Thomas Keeley was elected Director in place of G. R. Lewin, retired.

De Queen & Eastern.—B. H. Frick, General Freight and Passenger Agent, with office at De Queen, Ark., has resigned, effective Sept. 1.

East Broad Top.—A. W. Greenwood, Superintendent and Master Mechanic, with office at Rockhill Furnace, Pa., has resigned.

Mobile & Ohio.—T. J. Wilkinson, Track Supervisor at Murphysboro, Ill., has resigned.

New York Central & Hudson River.—W. H. Elliott, heretofore Signal Engineer of the Chicago, Milwaukee & St. Paul, has been appointed Engineer of Signals of the N. Y. C. & H. R., with headquarters at New York city, in place of Mr. Ten Eyck, transferred.

Northern Pacific.—E. C. Blanchard, hitherto Superintendent at Minneapolis, has been appointed Superintendent at Duluth, Minn., succeeding G. W. Vanderslice, resigned. The Minnesota division has been rearranged in two divisions, each with a superintendent, to become effective Oct. 1. The present Minnesota division extends from St. Paul to Fargo and includes the Fergus Falls branch, the Red River branch and the Little Falls and Dakota branch. The lower portion of this division will be called the St. Paul division, and will include the main line as far north as Staples, the Little Falls branch to Brainerd, and the Little Falls and Dakota branch, the lines to Stillwater and White Bear and the Minneapolis cutoff. This division will be in charge of M. M. Fowler, hitherto Assistant Superintendent at St. Paul. The other portion of the Minnesota division will still be known by that name, and will include the extension from Staples to Fargo, and will include the Red River branch and the Fergus Falls branch, and will be in charge of A. J. Sovereign, now Assistant Superintendent at Staples.

C. E. Allen has been appointed Master Mechanic, with headquarters at Glendive, Mont., succeeding T. J. Cutler, who has been transferred to a similar position at Jamestown, N. Dak. (See Chicago, Rock Island & Pacific.)

Pawnee.—C. F. Clendenen has been appointed Superintendent, Auditor and General Freight and Passenger Agent, with headquarters at Pawnee, Ill.

Pennsylvania.—J. J. Keenan, Supervisor of the Sunbury Division, with headquarters at Wilkesbarre, Pa., has been transferred to the Philadelphia Division. His office will be at Paoli, Pa. T. H. Ingham has been pro-

moted from Assistant Supervisor to the position left vacant by Mr. Keenan.

Pittsburg, Carnegie & Western.—E. V. Guyther, Locating Engineer for the extension in Green County, Pa., has been appointed Division Engineer in charge of the work, with headquarters at Waynesburg, Pa.

Pittsburg, Shawmut & Northern.—A. M. Lane has been appointed Superintendent, with headquarters at St. Marys, Pa., in place of C. H. Bevington, who has been assigned to other duties.

Southern California.—W. B. Beamer, Superintendent at San Bernardino, Cal., has resigned. The resignation will take effect Oct. 1.

Southern Pacific.—A. W. Baker has been appointed Assistant Superintendent of the Western Division, with headquarters at Oakland Pier, Cal., succeeding J. C. Wilder, transferred.

Toledo, St. Louis & Western.—Edwin Hawley and H. E. Huntington have been elected members of the Board of Directors of this company, succeeding J. Kennedy Tod and Alfred R. Pick, who recently resigned.

Union Pacific.—Horace I. Bettis, Assistant General Auditor, with office at Omaha, Neb., has resigned.

LOCOMOTIVE BUILDING.

The New York, Chicago & St. Louis is having 10 locomotives built at the Baldwin Works.

The Mexican Central is having 37 locomotives built at the Cooke Works of the American Locomotive Co.

The Pere Marquette, as reported in our issue of August 21, has ordered six simple ten-wheel (4-6-0) locomotives from the Brooks Works of the American Locomotive Co. for October, 1903, delivery. These locomotives will weigh 160,000 lbs., with 126,000 lbs. on drivers; cylinders, 20 in. x 26 in.; diameter of drivers, 69 in.; extended wagon top boiler with a working steam pressure of 200 lbs.; heating surface, 2,308 sq. ft.; 308 tubes, 2 in. in diameter, and 13 ft. 2¼ in. long; fire-box, 114 in. long and 41 in. wide; grate area, 32.46 sq. ft.; tank capacity, 6,000 gallons of water; coal capacity, 10 tons.

CAR BUILDING.

The Atlanta & West Point is in the market for 50 cars.

The Mobile & Ohio is in the market for 1,000 box and 1,000 coal cars.

The American Car & Foundry Co. has miscellaneous orders for 50 cars.

The Chicago Great Western is having two coaches built by the Pullman Co.

The Delaware, Lackawanna & Western is reported in the market for 20 passenger cars.

The New Orleans & Northeastern is reported in the market for a number of coal cars.

The Mather Stock Car Co. is having 100 freights built at the South Baltimore Car Works.

The Pratt Cereal Oil Co. is having five tank cars built at the Mt. Vernon Car Mfg. Works.

The Delaware & Hudson has ordered 50 ballast cars from the American Car & Foundry Co.

The St. Louis & Belleville (Electric) has ordered 100 coal cars from the American Car & Foundry Co.

The Richmond, Fredericksburg & Potomac has ordered 50 ballast cars from the American Car & Foundry Co.

The Pennsylvania has ordered 1,000 box cars, 300 gondolas and 100 steel coal cars from the Pressed Steel Car Company.

The Atchison, Topeka & Santa Fe has ordered six baggage cars from the Pullman Co., and 500 refrigerator cars from the American Car & Foundry Co.

The Fort Smith & Western has ordered 600 gondolas of 80,000 lbs. capacity from Haskell & Barker. Part of this order was reported in our issue of May 29.

The Chesapeake & Ohio, as reported in our issue of Aug. 21, has ordered 200 flat cars of 80,000 lbs. capacity from the American Car & Foundry Co. These cars will weigh 33,500 lbs., and will be 38 ft. 5½ in. long and 8 ft. 9 in. wide, over end sills, with wooden frames and underframes. Special equipment includes American Car & Foundry Co.'s axles, cast steel bolsters, Diamond brake-beams, Westinghouse brakes, M. C. B. brasses, Miner draft rigging, Poplar dust guards, cast iron journal boxes, Morris journal box lids, mineral brown paint, arch bar trucks, and American Car & Foundry Co.'s wheels.

The Mexican Central, as reported in our issue of Aug. 28, has ordered four first class and six third class coaches and five baggage cars from the Pullman Co. The first class coaches will be 59 ft. 1 in. long, over end sills; and the third class coaches and baggage cars will be 60 ft. long, over end sills; both class coaches and baggage cars will be 9 ft. 8 in. wide, over side sills, and 14 ft. 1 in. high, to top of roof. The special equipment for all includes: National-Hollow brake-beams, Westinghouse air-brakes, M. C. B. brasses, National Miller combination couplers, Forsyth curtain fixtures for first class coaches, Westinghouse friction draft rigging, Soule or Harrison dust guards, Baker heating system for first class coaches, McCord journal boxes and lids, Pintsch gas light, Valentine's rubber paint, Standard steel platforms for coaches, Mexican Central trucks and Pullman vestibules for coaches.

BRIDGE BUILDING.

AKRON, OHIO.—A steel bridge will be built at Perkins street to cost $12,000.

ATLANTA, GA.—The Georgia Railway & Electric Co. will build a steel bridge to cost about $20,000 over the Chattahoochee River at Bolton.

BALTIMORE, MD.—The County Commissioners have appropriated $15,000 for building a bridge over Gunpowder Falls at Bluemont. A part of the cost will be paid by adjacent property owners.

BINGHAMTON, N. Y.—The bids opened Aug. 18, for the Rock Bottom bridge, were: Springfield Construction Company, Springfield, Mass., $59,076; Canton Bridge Co., Canton, Ohio, $59,036; Colby & Co., Owego, N. Y., $59,518; United Construction Company, Albany, N. Y., $57,376; Penn Bridge Company, Beaver Falls, Pa., $57,070; Owego Bridge Company, $56,524; King Bridge Company, Cleveland, Ohio, $62,070; Mount Vernon Bridge Company, Mount Vernon, Ohio, $59,978; Rochester Bridge Construction Company, Rochester, N. Y., $57,179. Contract awarded to Owego Bridge Co., Owego, N. Y.

BROOKVILLE, PA.—The Clarion & Pittsburg will build a bridge of two spans over Red Bank Creek at Summerville, Pa.

CANTON, N. Y.—Bids are wanted Sept. 26, by the Town Board for a stone arch bridge over Grasse River at Main street.

CHICAGO, ILL.—Plans for three bascule bridges to replace present structures at Dearborn, Harrison and 22nd streets are being prepared. Isham Randolph, Security Building, is Chief Engineer.

CHILLICOTHE, MO.—Bids are wanted Sept. 7, by J. Y. Powell, Bridge Commissioner, for a bridge over Medicine Creek, also one on Trenton road, and repairs to two bridges.

CLARKSVILLE, VA.—The Clarksville Toll Bridge Co. has been organized to build a steel bridge 1,300 ft. long over the Dan and Staunton Rivers.

DES MOINES, IOWA.—Plans are being prepared for a concrete Melan arch bridge at Locust street. Address City Engineer Budd.

Bids will be asked in a few days for the Sixth street bridge, to cost about $50,000.

ELGIN, ILL.—A bridge may soon be built over Fox River at Kimball street to cost $15,000. Address Commissioner of Streets.

ELYRIA, OHIO.—Bids are wanted Sept. 15, by the Board of Public Service, for a double arch stone bridge over Black River at Mussey avenue. (July 31, p. 561.)

Bids are wanted Sept. 15 by the Board of Public Service, for a double arch stone bridge over the east branch of Black River at Washington avenue. (Aug. 14, p. 593.)

GERMANTOWN, PA.—A petition for a bridge is before the Germantown, Manayunk and Roxborough Councils, to be built from Walnut Lane, in Germantown, to Roxborough, over the Wissahickon, at a cost of about $100,000.

GUTHRIE, OKLA. T.—Plans for the building of a viaduct over the Santa Fe tracks from Noble avenue, Guthrie, to Sixth street, West Guthrie, reports state, have been made, and the cost of the work will be about $150,000. W. S. Gamble, City Engineer.

HONOLULU, H. I.—The Hilo-Kohala Railroad in Hawaii will require a number of steel bridges between Hilo and Hakalau. Construction work on the road will soon be begun.

HOUSTON, TEXAS.—W. G. Van Vleck, manager of the Southern Pacific's Atlantic system, announces that this company is to build 33 new bridges between San Antonio and El Paso. They will replace wooden structures.

KANSAS CITY, KAN.—Specifications of the viaduct over the tracks of the Union Pacific and the Chicago, Rock Island & Pacific railroads at Tenth street, in this city, for which bids are asked Sept. 15, by the Mayor and Council, call for a viaduct 1,168 ft. long. There will be three spans of 99 ft. each, one span of 111.3 ft., one span of 169.2 ft., two plate girders 44 ft. each, and six plate girders 34 ft. each. The north approach will be paved with brick, 830 ft., and the south approach with brick and asphalt, 216 ft. The roadway will be 37 ft. wide and the sidewalk 6 ft. The estimated cost is $120,000. S. G. McLoon, City Engineer.

LANCASTER, OHIO.—Bids are wanted Sept. 18, by F. L. Manger, County Auditor, for building the superstructure of the Kocher bridge in Madison Township.

LONDON, ONT.—The plans for a bridge over the Thames at this place provide for a single span of 160 ft., with two approaches of 48 ft. each, the cost to be about $10,000. Address the McClary Company, London, Ont.

MADISON, IND.—Bids are wanted Sept. 10 for a number of bridges in Jefferson County. Address G. F. Crozier, Auditor.

MAGNOLIA, MISS.—Plans are under way for a bridge 24 ft. wide and 240 ft. long to be built over Minnehaha Creek at Cherry street. Address Board of Aldermen.

MARION, IND.—The Chicago, Cincinnati & Louisville will, it is reported, build a 100 ft. steel bridge at Meridan street.

MILAN, MO.—Bids are wanted Sept. 9, by C. W. Reeves, Commissioner, for building three combination bridges and also for three steel bridges.

MORGAN CITY, LA.—Morgan's Louisiana & Texas Railroad has under consideration a drawbridge and approach spans over Berwick Bay at this city; it will be an expensive and deep foundation and the draw will be long.

NEW YORK, N. Y.—Bids opened Aug. 24, by Gustav Lindenthal, Commissioner of Bridges, for the construction of a plant, and the concreting in the anchor chain tunnels, etc., of the Williamsburg bridge over the East River for the Manhattan and Brooklyn anchorages were: For the Manhattan end, John Williams, $67,000; Ryan & Parker, $46,500, for the Manhattan and Brooklyn ends, United Engineering & Contracting Co., $44,905, $57,925; Henry J. Crawford, $39,100, $44,800; Degnon-McLean Contracting Co., $35,000, $44,000; John J. Hopper, $35,100, $38,800.

The time for the filing of bids for the Blackwell's Island bridge No. 4 over the East River has been extended to Sept. 24, by the Department of Bridges. Gustav Lindenthal is the Commissioner in charge.

OKLAHOMA CITY, OKLA. T.—The Choctaw, Oklahoma & Gulf will build a steel viaduct in Oklahoma City.

PHILADELPHIA, PA.—Director of Public Works Costello will ask for an appropriation of $202,700 to keep city bridges in repair. The number of bridges in the last annual report was 318, valued at $20,000,000.

PITTSBURG, PA.—The Wilkinsburg & Verona Traction Co., according to local reports, has obtained the consent of the Pennsylvania to build a viaduct 1,000 ft. long over its tracks from Seldon avenue, Verona, to Plum street, Oakmont.

POTTSVILLE, PA.—Bids are wanted Sept. 7, by the County Commissioners for two steel bridges, one at Rumble's Mill, in Union Township, and one over Bear Creek at Jefferson Station, South Manheim Township, also for repairs to three bridges.

ROCHESTER, N. Y.—A plan to bridge the Genesee River at Ridge Road is being considered by the County Supervisors. The probable cost of the structure will be $150,000.

SAN FRANCISCO, CAL.—Plans have been submitted to the Board of Harbor Commissioners for the bridge to be built over the Channel street waterway at Third street by the Atchison, Topeka & Santa Fe.

SOUTH BEND, IND.—A concrete arch bridge may replace the present structure on Vistula avenue, recently condemned. A. J. Hammond is the Engineer in charge.

TORONTO, ONT.—Bids for the bridge at Rosedale ravines are too high and new ones may be asked. The cost of the work is not to be in excess of $21,000. Address R. S. Holgate, the engineer in charge.

TRENTON, N. J.—It is reported in Trenton that the Burlington & Mount Holly Traction Railroad Company is to build a bridge across the Delaware River on the piers which now support the Pennsylvania railroad bridge. The Pennsylvania will soon be running all of its trains across the river on the new stone bridge, a short distance below the old bridge, and all or a part of the old bridge is to be taken down and will be utilized at Washington, where the bridge across the Potomac River is being renewed. The Burlington & Mount Holly Traction Railroad Company has filed with the Secretary of State a description of its route, and in this the line of the bridge is included.

Contracts have been filed to build four steel bridges in Lawrence Township, Mercer Co., New Jersey. The total cost will be $19,800. One over Stony Brook, two over Shabbacong Creek, and one over Shipetaukin Creek. Work will begin at once.

TULSA, IND. T.—A contract, is is stated, has been awarded to the Canton Bridge Co., Canton, Ohio, for a combined railroad and highway bridge over the Arkansas River 1,350 ft. long.

VESTAL, N. Y.—A bridge over the Susquehanna River between this place and Union is under consideration, the cost to be about $40,000.

WASHINGTON, D. C.—Bids are wanted Sept. 5, by the District Commissioners, for the widening of the Aqueduct bridge. Address John Biddle, Commissioner, Washington, D. C.

Active work will at once be begun on the new Pennsylvania Railroad bridge over the Potomac. J. W. Melton, who will have charge of the work for the American Bridge Co., has arrived on the spot with a large force of steel workers. There are to be twelve spans of steel, the central one, the largest, being 240 ft. long. This span is to be erected by the American Bridge Co. The others, each 216 ft. long, are to be put in place by the railroad company.

A contract will be awarded by direction of the War Department to the Pennsylvania Steel Co. for the building of the highway bridge over the Potomac River above the Long Bridge. (Aug. 21, p. 509.)

WEST UNION, OHIO.—Bids are wanted Sept. 14, by Adams County Commissioners for a bridge with stone or concrete substructure and a span of 230 ft., or with steel substructure with three spans, consisting of two of 50 ft. and a center span of 200 ft.

Bids are wanted at the same time for a 75-ft. steel bridge over Isaac's Creek. R. A. Stephenson, County Auditor.

WILLIAMSPORT, PA.—The County Commissioners recently awarded contracts for a bridge over Black Hole Creek in Montgomery, and Muney Creek in Franklin Township. These have been cancelled as the price was too high and new bids will be let.

WILLIMANTIC, CONN.—A resolution has been passed at a special town meeting to build a bridge, at a cost of about $75,000, over the Willimantic River and across the railroad tracks from Pleasant street to Main street in Willimantic.

WILMINGTON, DEL.—The Pennsylvania will build a bridge over the Brandywine, with a draw.

YOUNGSTOWN, OHIO.—Plans for the improvement of the East Federal street bridge, to be paid by the city, county and Mahoning Valley Railway Company, place the total cost at $26,000.

Other Structures.

BEAUMONT, TEXAS.—The roundhouse of the Atchison, Topeka & Santa Fe recently destroyed by fire will be rebuilt at once.

BINGHAMTON, N. Y.—The Erie station is to be rebuilt at a cost of about $40,000.

BIRMINGHAM, ALA.—Local press reports say that the Louisville & Nashville has given a contract to Cook & Laurie, of Montgomery, for a roundhouse and turntable to be built near Boyles at a cost of about $64,000.

BUFFALO, N. Y.—Sealed bids will be received by H. Fernstrom, Chief Engineer New York Central & Hudson River Railroad, New York, 3 p.m., Sept. 15, 1903, for the building of a brick freight house, 40 ft. x 439 ft., on Erie street, in Buffalo.

CAPE MAY, N. J.—The Pennsylvania, it is reported, has bought land for a new station and other improvements.

CLEVELAND, OHIO.—The plans for a union station at Cleveland, we are told by an officer of the Lake Shore & Michigan Southern, have not yet been completed.

CORBIN, KY.—The Louisville & Nashville, reports say, will build a new roundhouse with 40 stalls.

DENISON, TEXAS.—The Missouri, Kansas & Texas will expend $50,000 for new passenger stations on its lines in Texas.

ECHO, TEXAS.—It is announced that the Texas & New Orleans Railway will expend $125,000 on its terminal improvements at this place.

FROSTBURG, MD.—Bids are wanted Sept. 10, by B. S. Randolph, Mining Superintendent, for driving a drainage tunnel on the property of the Consolidation Coal Co., as advertised in the *Railroad Gazette*.

MANKATO, MINN.—The Chicago Great Western, reports say, will build a stone and brick station at Northfield.

Oakland, Cal.—The Southern Pacific, it is reported, will build a brick and stone passenger station in Oakland.

Pensacola, Fla.—The new warehouse and wharf to be built by the Louisville & Nashville, it is reported, will cost about $100,000.

Philadelphia, Pa.—The Pennsylvania, it is stated, has awarded the contract to Armstrong and Latta for a freight house near 50th street and Columbia avenue.

Schenectady, N. Y.—Plans are being made by the Schenectady Railway Co. for a brick repair shop 250 ft. by 300 ft.

Winnipeg, Man.—The Manitoba Construction Company has been awarded the contract by the Canadian Pacific for building the new shops, including car, locomotive and machine shops and other structures. The report states the company has also awarded a contract to Grace Brothers, of Winnipeg, for a roundhouse.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Anderson, Elwood & Lapel.—Rights of way are being secured for a line from Elwood, Madison County, Ind., southwest via Lapel to Brazil, Clay County, 85 miles. Connection will be made at Elwood with the Pennsylvania Lines West of Pittsburg, and at Brazil with the Chicago & Eastern Illinois and the Terre Haute & Indianapolis. Thomas Newkirk, Elwood, Ind., is interested.

Beaumont, Kansas City & Gulf.—It is reported that this company will build an extension from Weed, Texas to San Augustine, 35 miles. Contract for grading is reported let to J. Owens, Houston, Texas.

California Roads.—Press reports state that an electric railroad will shortly be built from Watsonville, Cal., east to Hollister, 20 miles. This line will connect at both points with the Southern Pacific.

Canadian Roads.—The following railroad companies have recently been granted incorporation by the Dominion Parliament: Guelph & Georgian Bay; Canadian Yukon Western; Niagara, Queenston & St. Catharines; Chatham, Wallaceburg & Lake Erie; Berlin, Waterloo, Wellesley & Lake Huron; and the Brandon, Saskatchewan & Hudson's Bay.

Chelan Ry. & Navigation.—Articles of incorporation have been filed by this company in the State of Washington. It is proposed to build from Pateros, Wash., south via Chelan Falls to Wenatchee, 50 miles. The company will also run steamboats on the Columbia and Okanogan Rivers, and on Lake Chelan. R. D. Johnson, Chelan, Wash., is Vice-President and General Manager.

Chicago & Eastern Illinois.—This company is reported to have purchased the entire frontage on the east side of Clark street, Chicago, between Taylor and 12th streets, for additional terminal grounds to facilitate the handling of freight, which has rapidly increased since the extension of the road to Thebes, Ill., where it connects with the St. Louis & San Francisco.

Chicago Great Western.—An officer writes with regard to the press reports about improvements on the main line between Kansas City and Oelwein, Iowa, that the only extensive improvements now under way are those on the Southwest Division, where 60 miles of track south of Des Moines is being re-laid with 85-lb. steel rails. A new bridge is being built over the Kaw River at Kansas City.

Choctaw, Oklahoma & Gulf.—This company has completed its extension between Guthrie, Okla. T., and Chandler, 60 miles. Connection is made with the St. Louis & San Francisco at Chandler, and with the Atchison, Topeka & Santa Fe at Guthrie.

Clarion & Pittsburg.—An officer writes that the proposed route of this road is from Clarion, Pa., east to Summerville, 17 miles, passing through Corsica, Day, Mechaniesville and Strattonville. Contracts for grading will be let within the next two weeks. The work will be comparatively light, with one 2 per cent. grade and one curve of 8 deg. There will be one bridge. C. F. Heidrick, Brookville, Pa., is President. (July 31, p. 562.)

Columbia River & Oregon Central.—Articles of incorporation have been filed by this company in Oregon. It is proposed to build from Arlington, Ore., south to Condon, 35 miles, with a branch southeast to Ione, 20 miles. Connection will be made with the Oregon Ry. & Navigation Company's railroad at Arlington. The incorporators are J. C. Ainsworth, H. F. Conner and Lewis Gerlinger, of Portland, Ore.

Council City & Solomon River.—An officer says that 10 miles of this proposed line from Council City, Alaska, to Solomon City, 50 miles, have been completed. A force of 500 men is working in two shifts, and it is expected that the entire line will be finished before the winter sets in. This is the first standard gage railroad to be built in Alaska. J. W. Dickson is General Manager, and E. A. Olds, Jr., Council City, is Assistant Treasurer. (May 22, p. 368.)

Denton, Decatur & Western and North Texas & Louisiana.—Press reports state that charters have been granted to these two companies in Texas and Louisiana. It is proposed to build from Decatur to Greenville, Tex., and from McKinney to Alexandria or Mansfield, La., with a branch from Decatur west to Roswell, N. Mex., a total distance of 700 miles. W. H. Sisson, St. Louis, Mo., is president, J. L. Morton is vice-president and M. J. Healy, Decatur, Tex., is general manager.

Des Moines & Southern.—A contract for grading the extension from Winterset southwest to Greenfield, Ia., has been let to Winston Bros., who have in turn sublet a good part of the work to Phalen & Shelley and to Fitzgerald & Shardall. Rights of way have been practically all secured, and work has been begun. F. W. Cherry, Des Moines, Ia., is interested. (May 8, p. 336.)

Durham & Charlotte.—Rights of way have been secured and surveys finished for the extension of this road from Pittsboro, N. C., northwest to Greensboro, 48 miles. The company will begin work immediately with its own forces at Pittsboro. J. L. Tull, Pittsboro, N. C., is Chief Engineer. (July 31, p. 562.)

Fort Smith & Western.—An officer writes that tracklaying has reached Warwick, Okla. T., a distance of 186 miles from Fort Smith, Ark. Connection is made with the St. Louis & San Francisco at Warwick. H. A. Schwanecke, Fort Smith, Ark., is Chief Engineer.

Huron & Ontario (Electric).—Surveys are reported in progress for building this electric line, which will be 30 miles long. Contracts for grading will shortly be let and work will be begun early in the spring of 1904. M. K. Cameron, Meaford, Ont., is interested.

Indianapolis Northern Traction.—Contract is reported let to J. G. White & Co., New York, for building this electric railroad from Marion, Ind., north to Wabash, 20 miles. It is proposed eventually to extend the line north through North Manchester to Warsaw, parallel to the Cleveland, Cincinnati, Chicago & St. Louis for the greater part of the distance. G. A. H. Shideler and E. H. Neal, of Marion, Ind., are interested. (See Construction Supplement.)

Indianapolis, Shelbyville & Southeastern.—A contract for grading this line from Shelbyville, Ind., southeast to Greensburg, 25 miles, has been let to Townsend, Reed & Co. Work will be begun at once. The new line will parallel the Cleveland, Cincinnati, Chicago & St. Louis from Shelbyville to Batesville. J. C. Power, Indianapolis, is the engineer in charge of the work. (May 8, p. 336.)

Indianapolis Southern.—The contract for grading this line from Indianapolis to Sullivan, 140 miles, has been let to the Southern Construction & Equipment Company. Rights of way have been secured, and work will be begun at once. T. H. Hazelrigg, Indianapolis, is Chief Engineer. (Aug. 28, p. 624.)

Kentucky Roads.—Press reports state that a railroad will shortly be built from Wheatcroft to Providence, 10 miles. I. H. Wheatcroft, Wheatcroft, Ky., is said to be interested.

Lincoln, San Francisco & Eastern.—Surveys are reported in progress on this proposed road from Vernon, Sutter County, Cal., east to Lincoln, Placer County, 15 miles. C. L. Wilson, Nevada City, Cal., is interested. (March 13, p. 204.)

Louisville & Nashville.—Contract has been awarded to C. D. Smith & Co., Memphis, Tenn., for building the new yards at Corbin, Ky. Work will be begun at once, and it is stated that about 25 miles of track will be laid.

Louisiana Roads.—Press reports state that a railroad will shortly be built from New Orleans west to Thibodaux, La., 45 miles, with a branch south to Grand Isle, 50 miles. F. B. Merrill, formerly President of the Mobile, Jackson & Kansas City, is said to be interested.

Minneapolis, St. Paul & Sault Ste. Marie.—An officer writes that grading is about two-thirds completed on the extension from Glenwood, Minn., north to a point in the White Earth Indian reservation in Norman County. Contract for track laying has been let to E. J. Brennan, St. Paul, Minn., and work will be begun at once. (May 29, p. 384.)

Niagara Transfer.—Maps have been filed by this company showing the proposed route from Buffalo, N. Y., to Tonawanda, 10 miles. Connection will be made with the New York Central & Hudson River at Tonawanda. J. C. Conway and T. C. Becker, Buffalo, N. Y., are said to be interested. (See Construction Supplement.)

Northern Pacific.—The cut-off from Grand Coulee, Wash., to Adrian, 20 miles, has been finished, and is now opened for traffic. Connection is made with the Great Northern at Adrian. (May 8, p. 336.)

Ocilla & Valdosta.—A charter has been asked for this company. It is proposed to build from Valdosta, Ga., north through Lowndes, Berrien and Irwin counties to Ocilla, 55 miles. It is not stated whether this new company has any connection with the Ocilla, Pinebloom & Valdosta. J. A. Henderson, J. H. Powell, J. C. Luke and J. J. Walker, of Ocilla, Ga., are interested.

Osage R. R.—This company has been incorporated in Oklahoma Territory, with a capital of $220,000, to build from a connection with the Missouri, Kansas & Oklahoma, in the Osage Nation, northeast to a point not yet determined in the northern part of Indian Territory. According to press reports this is a Missouri, Kansas & Texas project.

Pere Marquette.—This company has been granted a license by the Secretary of the State of Illinois, to incorporate in that State. The capital stock is said to be $28,000,000.

Philadelphia & Reading.—It is reported that this company will build a new branch from Girardsville, Pa., west to Locust Summit, eight miles. The line will avoid the heavy grades and curves on the existing branch between these points.

Pine Bluff & Western.—Incorporation has been granted this company in Arkansas. It is proposed to build from Sheridan to Benton, Ark., 25 miles. The Pine Bluff & Western now in operation between Pine Bluff and Sheridan is to be purchased. C. H. Brown, M. Danaher, W. T. Radford and Clarence Green, of Pine Bluff, are directors.

Pittsburg & Lake Erie.—The extension from Fayette City, Pa., south to Brownsville, nine miles, was opened for traffic on August 31. It connects with the Monongahela division of the Pennsylvania at Brownsville. (July 3, p. 502.)

Register & Glenville.—Work is reported begun on the extension of this road from Coe, Ga., to Glenville, 7 miles. Surveys are completed and rights of way secured. W. C. Perkins, Hagan, Ga., is interested. (See Construction Supplement.)

Rochelle & Southern.—The newspapers say that this line is practically completed from Rochelle, Ill., south to Ladd, 40 miles. The line intersects the Chicago & North Western, Chicago, Burlington & Quincy and the Illinois Central. McIntosh Bros., Milwaukee, Wis., are the contractors. (May 7, p. 320.)

St. Louis & North Arkansas.—Contract is reported let for building an extension from Marshall, Searcy County, Ark., southeast to Quitman, in Cleburne County, 45 miles. The line now runs from Seligman, Mo., to Marshall, Ark., 130 miles. John Scullin, St. Louis, Mo., is President, and S. W. Lee, Harrison, Ark., Chief Engineer. (See Construction Supplement.)

St. Louis Valley (Missouri Pacific).—It is reported that an extension will be built from Thebes, Ill., southeast to Cairo, 25 miles. The road at present runs from St. Louis down the east side of the Mississippi River to Thebes, 118 miles. (May 22, p. 368.)

Santa Fe Central.—The newspapers say that surveys are now in progress for an extension from Torrence, N. Mex., southeast to Big Springs, Texas, where connection will be made with the Texas & Pacific. The total distance is 300 miles. This company recently completed its line between Santa Fe and Torrence, 117 miles. (Aug. 28, p. 624.)

Southern, Sonora & Alamos.—Press reports state that valuable concessions have been granted this company by the Mexican Government. The proposed road will run through Yavarros, Navajoa and Alamos, and will open up a rich mining district. A. P. Ballou is said to be interested.

Tennessee Western.—Surveys are reported in progress on this road from Humboldt, Tenn., west through Alamo, to Dyersburg, 60 miles. The line will run through Gibson, Crockett and Dyer counties, and the road will probably be extended eventually to the Mississippi River. Connection will be made with the Illinois Central at Dyersburg, and with the Mobile & Ohio at Humboldt. J. H. Connor, Nashville, Tenn., is said to be interested. (July 17, p. 534.)

Texas Short Line.—Surveys have been finished for an extension from Grand Saline, Texas, southwest to Canton. The work will be light, with a maximum grade of 1 per cent. The road at present runs from Alba to Grand Saline, 10 miles. P. A. McCarthy, Lufkin, Texas, is Consulting Engineer. (See Construction Supplement.)

Topeka, Lawrence & Kansas City (Electric).—Application has been made for a charter to build an electric railroad 75 miles long through the counties of Shawnee, Douglas, Johnson and Wyandotte, in Kansas, and Jackson County, in Missouri. The authorized capital is $4,000,000.

Trinity & Brazos Valley.—The newspapers say that this road is practically completed betwen Cleburne, Tex., and Mexia, 70 miles. Surveys are in progress for an extension of the line as soon as it is completed, from Mexia southeast to Trinity and Huntsville, and eventually to Beaumont, 170 miles. (May 8, p. 336.)

Virginia & Southwestern.—The newspapers say that this company will build an extension from Elizabethton, Tenn., west to Okalona, 12 miles. The new line will parallel the Southern between these points. J. B. Newton, Bristol, Tenn., is Vice-President and General Manager.

Western Alleghenny.—This road has been completed from Queen Junction, Pa., on the Bessemer & Lake Erie to Kaylor, 20 miles, and was opened for traffic on August 20.

West Virginia Roads.—It is reported that a logging road will be built from Maribell, W. Va., to the summit of Shaver Mountain, 3 miles. The Morrison & Bell Lumber Company is behind the project. W. P. Smith, Elkins, W. Va., is said to be interested.

GENERAL RAILROAD NEWS.

Burlington & Hinesburg.—See Burlington & Southeastern below.

Burlington & Southeastern.—This company has been organized with a capital of $3,000,000 and has taken over the Burlington & Hinesburg Railroad which is projected between Burlington and Hinesburg, Vt., 15 miles. Six miles of this road were built in 1902. A bond issue has been authorized to pay for several new extensions, and to retire $250,000 of 5 per cent. gold bonds of the Burlington & Hinesburg, due 1926. H. D. Clark is President, and F. O. Sinclair, Secretary.

Chicago & North Western.—The annual report of this company for the 12 months ending May, 1903, shows total gross earnings of $49,842,780, an increase of $3,198,659 over the corresponding period ending in 1902. Operating expenses increased $3,254,470, leaving a decrease in net earnings of $55,811.

Cincinnati Inter Terminal.—The City Council of Cincinnati recently voted to grant this company a franchise for a double-track elevated line from the Cincinnati, Hamilton & Dayton station to the Chesapeake & Ohio bridge. (See under Railroad News, Aug. 28, p. 624.)

Delaware, Lackawanna & Western.—The Sinking Fund Commission of New York City have granted this company a franchise for a ferry from 22nd and 23rd streets on the North River to Ferry street, Hoboken, in place of the old 14th street ferry. The company has increased the number of boats on the Hoboken Ferry (recently purchased) from seven to nine. These boats land on the New York side of the river at Barclay and Christopher streets.

Erie.—The gross earnings of this company for the year ending June 30, 1903, were $45,830,413, as against $40,894,433 in 1902, an increase of $4,935,980. Operating expenses were $29,925,758, a decrease of $1,998,660, leaving net earnings of $15,904,654, an increase of $2,937,319. After deducting interest on bonds, and dividends on first preferred stock, there is left a surplus of $5,948,580 as against $2,947,905 last year. The report shows that about 5 per cent. has been earned on the common stock.

Fort Smith & Western.—This company has filed a mortgage for $5,000,000 with the Mercantile Trust Company of New York. It is stated that the proceeds are to go toward building the line which is now under construction from Fort Smith, Ark., to Guthrie, Okla. T.

Grand Trunk.—The stockholders have voted to approve the recent act of the Canadian Parliament increasing the 4 per cent. guaranteed stock from $26,100,000 to $50,000,000. Sir Charles Rivers Wilson, President of the company, denies a report that this increase is to be used to build a transcontinental railroad.

Illinois Central.—This company has purchased the Indiana & Illinois Southern which runs from Effingham, Ill., to Switz City, Ind., 88 miles. It will be known in future as the Effingham division of the Illinois Central.

Indiana & Illinois Southern.—See Illinois Central above.

Morristown & Erie.—This is the name of the new company which has been formed by the consolidation of the Whippany & Passaic River railroad and the Whippany River railroad. The latter runs between Morristown, N. J., and Whippany, a distance of five miles. R. B. McEwan, New York City, is Treasurer.

New York, Chicago & St. Louis.—Gross earnings of this company for the fiscal year ending June 30 were $7,962,891, an increase of $698,025; net earnings were $1,797,480, an increase of $70,461. An increase of $44,510 was shown in the total surplus.

Whippany River.—See Morristown & Erie above.